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Forest Service

Tongass  
National  
Forest  
R10-MB-350

October 1997



# Crystal Creek Timber Harvest

## Draft Environmental Impact Statement



NOV 19 1997

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United States  
Department  
of Agriculture

Forest  
Service

Alaska Region  
Tongass National Forest

Stikine Area  
P.O. Box 309  
Petersburg, Alaska 99833  
(907-772-3841)

File Code: 1950

Date: October 14, 1997

Dear Participant:

Enclosed is a copy of the Draft Environmental Impact Statement (DEIS) for the proposed Crystal Creek Timber Harvest. We are encouraging public comment on this DEIS.

The project area is located on the mainland near Point Agassiz in the Patterson and Muddy River Watersheds. This document analyzes a no action alternative and four action alternatives which address issues identified during the public scoping process. The primary issues identified were moose management, biological diversity, recreation, transportation management, and timber management. Total volume proposed for harvest by the action alternatives ranges from approximately 14 million board feet to 18 million board feet. Several different harvest methods are proposed. Precommercial thinning of existing second growth stands is proposed in all alternatives.

The comment period on the DEIS will be at least 45 days from the date on which notice of availability of the DEIS is published in the Federal Register. It is anticipated that the comment period will begin in late October, 1997. Public meetings in Kake and Petersburg will be scheduled during the comment period. Written comments will be accepted at the meetings or may be sent to Bruce Sims, P.O. Box 309, Petersburg, AK, 99833. Please send your response by December 23, 1997, if you would like to have it incorporated into the Final Environmental Impact Statement. The Final is scheduled to be completed by late February, 1998. A brief discussion of legal requirements for individuals wishing to comment on this DEIS is attached.

The responsible official for the decision is Patricia A. Grantham, Acting Forest Supervisor of the Stikine Area, Tongass National Forest, Alaska Region. For additional information, please contact Bruce Sims, P.O. Box 309, Petersburg, AK, 99833, or call (907) 772-3841.

Sincerely,

PATRICIA A. GRANTHAM  
Acting Forest Supervisor

Enclosure







## ATTACHMENT - LEGAL REQUIREMENTS

The National Environmental Policy Act and Forest Service policy set the legal framework for analysis of alternatives and consensus building between individuals and groups with differing interests. Federal court decisions have established that reviewers of DEIS's must structure their participation so that it is meaningful and alerts an agency to the reviewer's position and contentions. Environmental objections that could have been raised at the Draft stage may be waived if not raised until after completion of the Final Environmental Impact Statement. This is so substantive comments and objections are made available to the Forest Service at a time when it can meaningfully consider them and respond to them in the Final.

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to 7 CFR 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under the FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied, the agency will return the submission and notify the requester that the comments may be resubmitted with or without name and address.





# **Crystal Creek Timber Harvest**

## **Draft Environmental Impact Statement**

**Tongass National Forest - Stikine Area  
USDA Forest Service  
Alaska Region**

<b>Lead Agency:</b>	Tongass National Forest, Stikine Area P.O. Box 309 Petersburg, Alaska 99833
<b>Responsible Official:</b>	Patricia A. Grantham, Acting Forest Supervisor Tongass National Forest, Stikine Area
<b>For Further Information Contact:</b>	Bruce Sims Tongass National Forest, Stikine Area P.O. Box 309 Petersburg, Alaska 99833 (907) 772-3841
<b>Abstract:</b>	The Stikine Area of the Tongass National Forest proposes to make approximately 16 million net board feet (MMBF) sawtimber and utility volume available for harvest within the Crystal Creek Project Area using a variety of silvicultural prescriptions. This project would include necessary road construction for the transport of timber. The existing log transfer facility would be reconstructed at Thomas Bay.





# Summary

## Introduction

This document is a Draft Environmental Impact Statement (DEIS) that proposes timber harvest on the Stikine Area of the Tongass National Forest. For many years, the Forest Service has been mandated to write environmental documents to meet the standards in the National Environmental Policy Act (NEPA).

The following pages include: a description of the proposed action, the purpose and need for the action, issues that arose during scoping, alternatives that address the issues, and mitigation measures for possible resource impacts. This is just an overview of the DEIS. Detailed information on each of these sections is included in the chapters that follow.

### Proposed Action

The Stikine Area of the Tongass National Forest proposes to make approximately 16 million net board feet (MMBF) sawtimber and utility volume available for harvest within the Crystal Creek Project Area using a variety of silvicultural prescriptions. This project would include road construction necessary for access to and transport of timber. The existing log transfer facility at Thomas Bay would be reconstructed.

### Purpose and Need

The purpose of this project is to implement the 1997 Tongass Land Management Plan, hereinafter referred to as the Forest Plan, by making available approximately 16 MMBF net sawtimber plus utility volume, hereinafter referred to as timber volume, to the timber industry as part of the Stikine Area timber program. The need for this project is to contribute to an orderly and a sustained volume of wood fiber to meet local and national demand and provide local and regional employment opportunities. Another need which has been identified through project scoping is to maintain or enhance a balance between forage and winter habitat to sustain a huntable moose population.

### Decisions to be Made

The responsible official for this project is the Stikine Area Forest Supervisor. The management decisions to be made based on the environmental analysis, the market demands, and the goals of the Forest Plan are:

1. whether or not timber harvest will occur in the Crystal Creek Project Area at this time;
2. how much timber will be made available for harvest;
3. location and design of the harvest units, including silvicultural and logging methods;
4. location and design of road construction and reconstruction, including maintenance;
5. what mitigation measures will be implemented; and
6. what balance will be maintained between forage and winter habitat for moose.

Also, included in the decision are opportunities for recreation, wetland, and wildlife habitat enhancement. These include:

1. whether or not to provide increased recreational developments,
2. whether or not to enhance a wetland northeast of Muddy River,
3. whether or not to do timber stand improvement (thinning or pruning) in second-growth stands, including areas that are not managed for timber production, and
4. whether or not changes are needed in size and/or location of the small Old-Growth Habitat Reserves (OGRs) identified in the Forest Plan.

## **Location**

The Crystal Creek Project Area is located on the mainland, approximately seven to twelve miles northeast of Petersburg, Alaska (see Map 1-1). The project area of approximately 64,000 acres is located in Townships 56, 57, 58 South; and Ranges 79, 80, 81, 82 East, Copper River Meridian. There is a block of State land of approximately 2600 acres south of Thomas Bay. Private ownership, totaling 1,133 acres, occurs near Point Agassiz.

The project area includes the Patterson River drainage (VCU 487) and the Muddy River drainage (VCU 489). Crystal Creek is a tributary of the Muddy River. This includes the Point Agassiz Peninsula, Bock Bight Peninsula, Ruth Island, and the Brown Cove/Icy Cove Area. The Stikine-LeConte Wilderness Area lies southeast of the project area.

## **Significant Issues**

A significant issue provides the focus for one or more alternatives and can be used to compare alternatives. It does not relate to the number of people who made the comment.

Some concerns can be mitigated the same way and achieve the same impacts or lack of impacts in all alternatives. For example, buffer strips will protect fish habitat from the effects of timber harvest in all alternatives. The analyses on these concerns are briefly discussed under Other Environmental Considerations.

Comments were received from individuals, organizations, and other Federal and State agencies. We analyzed the comments we received and grouped comments where appropriate. As a result of our analysis, we determined that the following five issues were significant and within the scope of the project. In formulating alternatives, we considered each of the significant issues and varied the way they were addressed in each alternative.

### **Issue 1 - Timber Management and Economics**

Timber harvest is compatible in most of the Crystal Creek Project Area in accordance with the Forest Plan. This issue includes how the current economics differ for each action alternative, the opportunities for small operators, and the opportunities for future timber management including the management of second-growth stands.

### **Issue 2 - Moose Management**

The Crystal Creek Project Area is an important moose hunting area. The moose population increased after clearcutting occurred during the 1960s and 1970s. As the clearcuts develop into pole timber stands, understory forage is shaded out, and moose habitat declines. The issue includes management of moose habitat through time to provide a continuing supply of forage and winter habitat capable of sustaining a huntable moose population.

### **Issue 3 - Biodiversity**

Biological diversity is defined here as the distribution and abundance of different plant and animal communities and species within the project area. The issue includes timber harvest effects on the existing biodiversity of the area.

### **Issue 4 - Recreation**

One of the major recreational uses is for moose hunting in the fall. Other occasional uses include: bicycling the existing road system, sightseeing, camping, and freshwater fishing. This issue includes the change in recreation opportunities and addition of recreation developments, if an action alternative is selected.



## **Issue 5 - Transportation**

The Thomas Bay road system was constructed during the 1960s and 1970s for timber harvest. The road system is not connected to a community but serves the residents of Point Agassiz, a gravel operation, and recreationists. About half of the system is currently drivable by high-clearance vehicles. Portions have been made impassable by erosion and closure by brush. This issue includes changes in maintenance and extent of the road system if an action alternative is selected.

## **Alternatives Considered**

We developed the action alternatives for detailed analysis. Four action alternatives address the purpose and need and respond to resource concerns and scoping comments. Each action alternative provides a mix of resource use and protection, emphasizing different resource values based on the theme for which the alternative was developed. The no action alternative proposes little change in the present management.

Alternative maps (Figures 2-1 to 2-5) display general size and location of proposed harvest units and road locations. Timber volumes presented for each of the action alternatives are based upon current information. A table (Table 2-1) summarizes how each alternative responds to the significant issues.

### **No Action Alternative 1**

This alternative proposes no additional commercial timber harvest or road construction in the Crystal Creek Project Area at this time. Management activities, such as second-growth management, road maintenance, free-use timber, and existing recreational developments will remain at current levels.

Alternative 1 shows the small Old-Growth Habitat Reserves as designed by the Revised Forest Plan.

### **Alternative 2**

The objective of this alternative is to develop a moose habitat management plan in conjunction with timber harvest. The level and timing of the timber harvest is designed to sustain a balance between high production forage and moose winter habitat. Openings to produce forage for moose would be created by clearcuts with reserve trees and group selection. Where possible, harvest openings will be made in lower volume timber stands to minimize impact on the winter habitat. Moose winter range habitat needs will be met by forest not available for harvest and forest designated for single-tree selection harvest. Thinning and pruning of second-growth would be emphasized to prolong moose forage production. A three-sided recreation shelter and associated trail is proposed for the north end of Ess Lake.

Alternative 2 shows the small Old-Growth Habitat Reserves proposed by the Interdisciplinary Team (IDT). Minor modifications were made to the Forest Plan designs to be able to identify boundaries on the ground. Boundaries used included streams, large muskegs, land ownership boundaries, and existing clearcuts. In addition, about 800 acres was added to the reserve north of the Patterson River to meet Forest Plan criteria.

### **Alternative 3**

The objective of this alternative is to focus the timber harvest within the Timber Production and Modified Landscape LUDs and avoid timber harvest in the Point Agassiz area. Helicopter logging is used to access timber where roads can not be constructed using standard specifications.

The size of the small Old-Growth Habitat Reserves in the Point Agassiz area more than doubled (from 2,500 acres to 5,600 acres) following recommendations from U.S. Fish and Wildlife Service and ADF&G. The small Brown Cove Old-Growth Habitat Reserve increased by about 100 acres following their recommendations. The small Old-Growth Habitat Reserve north of the Patterson followed modifications by the IDT as in Alternative 2.

#### **Alternative 4**

The objective of this alternative is to attempt to mimic the natural openings caused by wind disturbance. Approximately 10% of the area within selected units will be harvested in small, dispersed groups to resemble natural gaps in the canopy. Opening size will be limited to less than one acre where feasible. Additional harvest using clearcut with reserve trees and more intensive group selection would help meet the objectives of timber harvest and moose forage production. Helicopter logging is used to access timber where roads can not be constructed using standard specifications.

Small Old-Growth Habitat Reserves follow IDT modifications as in Alternative 2.

#### **Alternative 5**

The objective of this alternative is to build the least amount of road to meet the timber harvest objectives while minimizing resource concerns. This alternative responds to public comments requesting no new roads. A limited amount of road construction was proposed to disperse timber harvest to lessen impacts to wildlife, scenery, and recreation. Within the Point Agassiz area, extensive use of single-tree selection is proposed in volume class 6 and 7 stands to maintain old-growth habitat characteristics. A three-sided recreation shelter and associated trail is proposed for the north end of Ess Lake.

Small Old-Growth Habitat Reserves follow IDT modifications as in Alternative 2.

#### **Identification of the Forest Service Preferred Alternative**

No Preferred Alternative has been identified for the Draft Environmental Impact Statement. The chosen alternative may be one of the ones presented here or other alternatives may be developed from the public comments and new resource information. The Deciding Official may select an alternative in its entirety or a combination during the decision.



## Alternative Comparison

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
<b>Issue 1. Timber Management and Economics</b>					
Total volume harvested (MMBF)	0	15.145	18.054	16.274	13.896
(MMCF)	0	4.206	4.698	3.933	3.980
Acres harvested by silvicultural prescription					
Clearcut with Reserve Trees-85% Removal	0	608	523	570	330
Group Selection - 10% Removal	0	0	145	848	0
Group Selection - 30% Removal	0	310	679	116	47
Group Selection - 40% Removal	0	0	0	0	351
Single Tree Selection - 20% Removal	0	14	14	183	313
Single Tree Selection - (0%, 20%, 40%, 60%)	0	82	0	82	82
Acres harvested by volume strata					
Low	0	162	23	141	30
Medium	0	174	151	168	106
High	0	384	570	449	427
Acres harvested by volume class					
class 4	0	306	148	326	73
class 5	0	315	570	340	211
class 6 and 7	0	71	13	116	240
Opportunity for Small Sales (MMBF)					
(Acres)	0	1.9	0.1	1.9	7.5
	0	131	14	131	714
Acres of second-growth treatment recommended	1,720	1,720	1,720	1,720	1,720
<b>Issue 2. Moose Management</b>					
% Change in estimated moose habitat capability from present to year 2010					
% Change without thinning <sup>1</sup>	-20%	-17%	-17%	-17%	-18%
% Change with thinning <sup>2</sup>	-10%	-6%	-6%	-6%	-7%
Amount of high-forage openings created by logging relative to the 20-year harvest rate suggested by the moose model by alternative by moose habitat management area (%) <sup>3</sup>					
West Muddy Moose Habitat Management Area <sup>4</sup>	0%	76%	0%	76%	91%
East Muddy Moose Habitat Management Area	0%	68%	65%	69%	14%
Patterson Moose Habitat Management Area	0%	106%	94%	60%	73%
Upper Muddy Moose Habitat Management Area	0%	44%	305%	106%	80%

<sup>1</sup> Without thinning assumes that no additional second growth treatments occur.

<sup>2</sup> With thinning assumes that about 1,720 acres of existing second growth will be thinned or pruned by year 2010 to prolong understory moose forage for an additional 20 years.

<sup>3</sup> A value much greater than 100% implies that it will be difficult to balance winter range and high-forage areas in the later stages of the timber harvest rotation within the Moose Habitat Management Area. A value much lower than 100% implies that the lack of high-forage habitat may soon limit moose numbers within the Moose Habitat Management Area without further logging or more intensified treatment of existing second growth.

<sup>4</sup> See the Moose Habitat Management Area Map (Figure 3-3) for the locations of the areas.

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
The estimated change in the number of moose harvested annually by Year 2010 (current annual average harvest is about 19 moose).					
Moose change without thinning <sup>5</sup>	-4	-3	-3	-3	-3
Moose change with thinning <sup>6</sup>	-2	-1	-1	-1	-1
<b>Issue 3 Biodiversity</b>					
Estimated acres of productive old-growth and % of 1954 total left after timber harvest					
Acres volume class 4+ old-growth left	22,280	21,560	21,530	21,560	21,810
% of 1954 Total	81.9%	79.3%	79.1%	79.3%	80.2%
Estimated acres and % of 1954 total volume class 6 and 7 old-growth modified by harvest, left after timber harvest, and outside the timber suitable for harvest					
Acres volume class 6+ modified by harvest	0	114	14	292	549
% of 1954 total	0.0%	1.5%	0.2%	3.8%	7.1%
Acres of suitable <sup>7</sup> volume class 6+ left after harvest	1,080	966	528	788	531
% of 1954 total	14%	12%	6%	10%	6%
Acres of unsuitable <sup>8</sup> volume class 6+ left after harvest <sup>9</sup>	1,756	1,756	2,294	1,756	1,756
% of 1954 total	23%	23%	30%	23%	23%
% Change in the estimated deer habitat capability from Present					
By Year 2010 without thinning <sup>5</sup>	-1.9%	-3.3%	-3.7%	-3.4%	-3.3%
By Year 2010 with thinning <sup>6</sup>	-0.2%	-1.6%	-2.0%	-1.7%	-1.6%
By Year 2040	-2.8%	-4.8%	-5.1%	-5.0%	-4.7%
% Change in Estimated marten habitat capability from Present to Year 2040	0%	-2%	-2%	-2%	-2%
% Change in Estimated brown creeper habitat capability from Present to Year 2040 <sup>10</sup>	0%	-0.8%	-0.6%	-0.9%	-1.8%
% Change in Estimated wolf habitat capability from Present to Year 2040	0%	0%	0%	0%	0%

<sup>5</sup> Without thinning assumes that no additional second growth treatments occur.

<sup>6</sup> With thinning assumes that about 1,720 acres of existing second growth will be thinned or pruned by year 2010 to prolong understory moose forage for an additional 20 years.

<sup>7</sup> Tentatively suitable forest as defined by the Forest Plan includes productive forest that is physically suitable for timber harvest, can be adequately restocked in five years with adequate response information available, not withdrawn from timber production, and has been identified in the Forest Plan Revision as suitable for timber management.

<sup>8</sup> Land on slopes greater than 72%, identified forested wetland soils, areas within riparian, beach, and estuary buffers are examples of areas not suitable forest land. The LUDs within the project area where timber harvest is suitable are: Timber Production, Modified Landscape, and Scenic Viewshed.

<sup>9</sup> The difference between Alternative 3 and the other alternatives reflect the effect of the Fish and Wildlife Service modifications to the Point Agassiz small reserve in protecting the highest volume old-growth.

<sup>10</sup> For the purposes of display it is assumed that all proposed timber harvest will occur by 2000.



Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Estimated open road density (miles/square miles of project area) post-timber harvest with and without road closures <sup>11</sup> .					
With Road Closures	0.19	0.22	0.24	0.22	0.22
Without Road Closures	0.23	0.44	0.41	0.46	0.37
Acres of timber harvest in mountain goat winter range.	0	257	466	267	210
Shortest distance in miles between roads and the beginning of Horn Cliffs mountain goat hunting area <sup>12</sup> .					
Constructed roads	1.8	0.6	0.6	0.2	1.8
Roads open to public motorized traffic	3.0	2.2	2.2	2.2	2.2
Potential effects on Subsistence Use of Resources.					
The estimated subsistence demand may likely exceed habitat capability					
Deer	No	No	No	No	No
Mountain Goats	No	No	No	No	No
Furbearers	No	No	No	No	No
Other Wildlife (not including moose)	No	No	No	No	No
Salmon and Finfish	No	No	No	No	No
Marine Invertebrates	No	No	No	No	No
Plants and other foods	No	No	No	No	No
Restrictions to existing access to subsistence resources are likely.	No	No	No	No	No
Increased Competition between users for subsistence resources is likely to result in restriction to current harvest seasons and bag limits					
Deer	No	No	No	No	No
Mountain Goats	* <sup>13</sup>	*	*	*	*
Furbearers	No	No	No	No	No
Other Wildlife (not including moose)	No	No	No	No	No
Salmon and Finfish	No	No	No	No	No
Marine Invertebrates	No	No	No	No	No
Plants and other foods	No	No	No	No	No

<sup>11</sup> All new roads and currently opened temporary roads are proposed to be closed. No alternative exceeds the U. S. Fish and Wildlife Service threshold-of-concern for wolves of 0.7 mile/square mile.

<sup>12</sup> The beginning of the Horn Cliffs goat hunting area is estimated to be the habitat above 2000 feet elevation on the Horn Mountains Range. A public closure of the road to motorized traffic will restrict motorized access into the Crystal Creek drainage in all alternatives.

<sup>13</sup> Motorized closure of the Crystal Creek Project Area roads to public access in Alternatives 2, 3, and 4 should adequately protect the Horn Cliffs goat population from overhunting. However, the possibility that overhunting would occur in these alternatives cannot be completely dismissed. The goat harvest is monitored annually by ADF&G. Further road closures and/or hunting restrictions might be necessary if overhunting were to occur. Under ANILCA, subsistence users would have a preference over non-subsistence users.

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
<b>Issue 4. Recreation</b>					
Construction of three-sided shelter and trail at Ess Lake	0	yes	0	0	yes
Number of acres that change from Semi-Primitive to Roded	0	5,135	4,688	5,171	1,547
Number of harvested acres seen from Visual Priority Travel Routes and other use areas.	0	150	120	100	121
<b>Issue 5 Transportation</b>					
Permanent Road construction miles	0	15.4	13.8	12.7	6.4
Temporary Road construction miles	0	6.0	4.7	10.6	9.2
Miles of road to be left open after harvest	17.2	19.9	21.5	19.9	19.9

## Other Environmental Considerations

There were many concerns raised during the public scoping and analysis that are not being treated as significant issues because they are mitigated in same way in all alternatives or are not significantly affected by any alternative. These are discussed briefly at the end of Chapter 3 after the discussion of the effects of the significant issues.

**Air quality** - No significant impact will occur by the implementation of this project to air quality within the project area. Minor amounts of particulates will be released with logging equipment exhaust and dust associated with logging operations.

**Fisheries and Water quality** - Mitigation measures including buffers will be used to prevent significant impact to the water quality and fisheries habitat.

**Heritage Resources** - A cultural resource survey was conducted and all sites will be avoided in accordance to law. We will coordinate with the State Historical Preservation Officer.

**Karst and Caves** - No karst or cave features were found in the project area.

**Lands** - Timber harvest activities may affect the private landowners in the area by increased traffic. Logging operations will not block existing roads.

**Minerals** - This project will not affect any mineral operations or future development in the area.

**Threatened, Endangered, and Sensitive (TES) Animals and Plants** - No significant impacts were found to occur to TES animals. No sensitive plants were found during surveys. A biological evaluation was done in accordance with the Memorandum of Understanding with the U. S. Fish and Wildlife Service.

**Wetlands** - Impacts to wetlands will be minimized through road location and unit design.

**Wild and Scenic Rivers** - The Patterson River was a candidate for Wild and Scenic River designation during the Forest Plan Revision planning process but was not recommended with the decision. Current unit designs do not affect the eligibility.



# Mitigation

The following mitigation measures would be required for implementing the project. For mitigation measures specific to each unit and road segment, see Appendix B, Unit and Road Descriptions. Maps at the end of Chapter 2 show general size and location of proposed harvest units.

## Heritage Resources

If cultural sites are discovered during project implementation, operations will cease as per the timber sale contract provisions, and the district archaeologist will be consulted.

## Water Quality and Fisheries

Pursuant to the Tongass Timber Reform Act of 1990 (TTRA), commercial timber harvesting would be prohibited within a buffer zone no less than one hundred feet in width on each side of all Class I streams (anadromous fisheries) and those Class II streams (resident fisheries) which flow directly into a Class I stream. To protect downstream water quality, Class III streams would receive protection through a combination of tree retention, directional felling of trees, suspension of logs, and split-yarding. The Forest Plan standards and guidelines for buffers on Class I, II, and III streams will be followed. Forest Plan standards and guidelines are more stringent than TTRA requirements.

Full bench construction and end hauling of excavated material would be required on designated areas to minimize soil erosion and to prevent sediment from entering streams (see Road Descriptions, Appendix B). Material endhailed during road construction will be placed on stable areas away from flowing water.

After use, temporary roads would be closed, water bars added at appropriate places, and drainage structures removed. Erosion control needed would be accomplished before closing roads.

Timing restrictions on in-stream road construction work would be implemented during critical periods to protect fishery resources (see Road Descriptions, Appendix B).

Stream crossings of Class I and II streams would be constructed to allow fish passage.

Temporary bridges will be used instead of small culverts to reduce soil disturbance and to protect fish passage when the road is closed.

## Wildlife

All timber harvest units in the selected alternative will be searched for raptor and marbled murrelet nests prior to implementation. If nests are found, habitat and timing restrictions will be established in accordance with the Revised Forest Plan Standards and Guidelines.

Loss of old-growth habitat is mitigated by permanent retention of Old-Growth Habitat Reserves, riparian buffers, beach and estuary buffers. In addition, acres of varying volume classes not in the suitable timber harvest land base will be retained as old-growth habitat. Other methods used to mitigate against loss include single-tree selection, group selection, and retaining reserve trees within clearcut harvest units.

Thinning and pruning will be done where possible to maintain understory for wildlife forage in existing second-growth stands.

Buffers of 330 feet have been designated around wetlands where waterfowl nesting and brood-rearing is likely. Within this buffer, harvest is generally limited to single-tree selection, group selection of 1/2 acre or less, and salvage logging of downed trees. Timing clauses during April 1 to July 31 will be adhered to limit logging activities. Some large-diameter trees will be topped to provide for future nest sites. Snag and replacement snag retention will be emphasized.

The Muddy River crossing into the Crystal Creek drainage will be closed to public motorized use during logging activities to limit increased harvest of the Horn Cliffs mountain goat population and trapping of wolves. Any new roads constructed into the Crystal Creek drainage or the Ess Lake area will be closed after timber harvest is complete.

Helicopter overflights of goat spring and summer range during logging operations will be restricted in the Upper Muddy and Crystal Creek drainages. Forested travel corridors will be maintained to allow goat movement in the Crystal Creek and Upper Muddy River drainages.

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# **Chapter 1**

## **Purpose and Need**

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# Chapter 1

## Purpose and Need

### Introduction

#### Proposed Action

The Stikine Area of the Tongass National Forest proposes to make approximately 16 million net board feet (MMBF) of sawtimber and utility volume available for harvest within the Crystal Creek Project Area using a variety of silvicultural prescriptions. This project would include road construction necessary for the access to and transport of timber. The existing log transfer facility at Thomas Bay would be reconstructed.

#### Purpose and Need

The purpose of this project is to implement the 1997 Tongass Land Management Plan (Forest Plan) by making available approximately 16 MMBF of net sawtimber plus utility volume, hereinafter referred to as timber volume, to the timber industry as part of the Stikine Area timber program. The need for this project is to contribute to an orderly and sustained volume of wood fiber to meet local and national demand and provide local and regional employment opportunities. Another need which has been identified through project scoping is to maintain or enhance a balance between forage and winter habitat to sustain a huntable moose population.

#### Decisions to be Made

The responsible official for this project is the Stikine Area Forest Supervisor. The management decisions to be made:

1. whether or not timber harvest will occur in the Crystal Creek Project Area at this time;
2. how much timber will be made available for harvest;
3. location and design of the harvest units, including silvicultural and logging methods;
4. location and design of road construction and reconstruction, including maintenance;
5. what mitigation measures will be implemented; and
6. what balance will be maintained between forage and winter habitat for moose.

Also, included in the decision are opportunities for recreation, wetland, and wildlife habitat enhancement. These include:

1. whether or not to provide increased recreational developments,
2. whether or not to enhance a wetland northeast of Muddy River,
3. whether or not to do timber stand improvement (thinning or pruning) in second-growth stands, including areas that are not managed for timber production, and
4. whether or not changes are needed in size and/or location of the small old-growth habitat reserves (OGRs) identified in the Forest Plan.

The Selected Alternative may be one of the ones in the Draft Environmental Impact Statement (DEIS) or a combination of these alternatives.

# **1 Purpose and Need**

## **Location**

The Crystal Creek Project Area is located on the mainland, approximately seven to twelve miles northeast of Petersburg, Alaska (see Map 1-1). The project area is approximately 64,000 acres. It is located in Townships 56, 57, 58 South; and Ranges 79, 80, 81, 82 East, Copper River Meridian. There is a block of State land of approximately 2600 acres south of Thomas Bay. Private ownership, 1133 acres, occurs near Point Agassiz.

The project area includes the Patterson River drainage (VCU 487) and the Muddy River drainage (VCU 489). Crystal Creek is a tributary of the Muddy River. Also part of the project area are the Point Agassiz Peninsula, Bock Bight Peninsula, Ruth Island, and the Brown Cove/Icy Cove Area. The Stikine-LeConte Wilderness Area lies to the southeast of the project area.

## **Background**

Providing a timber supply from the Tongass for sustained employment in the local wood products industry and related economic and social benefits, is an objective of the Forest Plan and the Alaska National Interest Lands Conservation Act (ANILCA), as amended by the Tongass Timber Reform Act (TTRA). Section 101 of TTRA directs the Forest Service,

“to the extent consistent with providing for multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber and (2) meets the market demand from such forest for each planning cycle.”

The Allowable Sale Quantity (ASQ) is the maximum quantity of timber that may be scheduled from suitable lands on the entire Tongass National Forest for the next ten years. It is expressed as an annual average quantity for the decade, but the yearly amount may vary. The ASQ is a ceiling; it may not project the future sale level or reflect all the influences on the future sale level. According to the recent decision for the Forest Plan Revision, the average annual ASQ is 65 Million Cubic Feet (MMCF) which translate to 267 million board feet (MMBF) of both sawlog and utility wood (Forest Plan, Appendix L).

The influences on the future sale level include market demand and constraints of other resource needs. The estimates in the Forest Plan of market demand include considerations of recent changes in world timber and wood product markets and the closure of both Southeast Alaska pulp mills. The pulp mill closures have significantly affected the utility volume demand, but not the sawtimber demand (Forest Plan, FEIS, Appendix M).



# Legend









-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  Existing Managed Stands
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

Figure 1-1  
Project Area Map



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY

0 7920 15840  
Scale is 1 inch = 7920 feet





## **Project Implementation Scheduling**

The Crystal Creek project was added to the current ten year timber schedule in 1992 in accordance with direction to review and update the schedule as needed. Scheduling in advance is needed in order to complete the environmental analysis and on-the-ground layout prior to the timber sale appraisal. The identification of projects is based on prospective public issues, management concerns, and resource opportunities.

Currently, timber harvest from this project is planned for offer in 1999 with a volume of 16 MMBF. The volume of 16 MMBF was based on the inventory of the amount of suitable acres available for harvest, location and time of previous harvest, and restraints from other resources.

This project is shown on the sale schedule as one sale, but it may be divided into smaller sales and either sold the same year or subsequent years depending on demand and financial feasibility. The volume will be sold to independent operators and may be part of the Small Business Administration (SBA) volume. Region 10 has a commitment with the SBA to provide 100 MMBF region-wide through the SBA program. This amount of volume and the location of the volume is determined jointly by the Regional Forester and the SBA on an annual basis.

## **Management Direction**

The following documents provide the management direction used in developing the proposed action and alternatives. They are incorporated into the planning record for this project by reference.

## **Tongass Land Management Plan (May 1997)**

The Forest Plan was revised in order to better reflect the public's wants and needs and the new ecosystem management information on the Tongass National Forest. Our analysis is guided by the Tongass National Forest Land Management Plan of May 1997 which provides direction (land use designations, goals, objectives, management prescriptions, standards and guidelines) to achieve the desired future condition for the area. The Forest Plan allocates portions of the project area to six Land Use Designations: Timber Production, Modified Landscape, Scenic Viewshed, Old-Growth Habitat, Semi-remote Recreation, and Special Interest Area (Map 1-2)

The Forest Plan designates the largest part of the area to Scenic Viewshed (22,182 acres) which includes the Point Agassiz Peninsula, Patterson River area, Muddy River area, and the coastline along Brown Cove and Icy Cove. The Crystal Creek drainage and upper Patterson River are designated Modified Landscape (12,422 acres), and the upper Muddy River is classed as Timber Production (13,960 acres). Old-growth Habitat Land Use Designation includes 9,799 acres within three small Old-Growth Habitat Reserves. Appendix D provides a description of these Land Use Designations. A small portion of the Patterson Special Interest Area (1,604 acres) is also within the project area. Three of these Land Use Designations (Timber Production, Modified Landscape, and Scenic Viewshed) allow for timber harvest. The Modified Landscape and Scenic Viewshed designations have guidelines for less intensive timber management.

## **Desired Future Condition**

The Thomas Bay Area has traditionally been used for a variety of resource values, such as timber harvest, recreation, and wildlife habitat. We plan on continuing to provide this mix of resource values. The Land Use Designations from the Forest Plan Revision provide a more detailed description of the desired future condition (Appendix D.)



# **1 Purpose and Need**

## **Alaska Regional Guide, 1983**

The Alaska Regional Guide was also used for guidance for management activities proposed by this analysis. Relevant portions of the Regional Guide as amended by the Forest Plan are incorporated by reference into this Draft Environmental Impact Statement.

## **Analysis**

The analysis is dictated by the National Environmental Policy Act (NEPA) and the regulations of the Council of Environmental Quality, and the Record of Decision for the Tongass Land Management Plan. This includes guidance for public involvement and for consultation with other agencies. We take available information to list a project on the ten-year plan. Then pre-project analysis takes place, including on-site inventory, evaluation of previous public comments, and review of prior environmental analyses. Public scoping is done and the results are used to develop issues and alternatives. These alternatives are presented in a Draft Environmental Impact Statement (DEIS) which is reviewed by the public. Comments on the DEIS are used to modify or develop other alternatives for the Final Environmental Impact Statement (FEIS). The responsible official (in this case the Forest Supervisor) uses the public comments and the environmental effects analysis to determine if the project will be implemented. This decision is documented in the Record of Decision (ROD) which will be published as part of the FEIS.

## **Public Involvement**

The public involvement process begins soon after a project to implement direction in the Forest Plan is proposed. Information about the project is listed in the quarterly project schedule which is distributed to the public. The next step of the process is to begin public scoping.

The Crystal Creek Timber Harvest project first appeared on the Stikine Area Project Schedule in October 1996 (Volume 5, Issue 4). A scoping document was sent out in November 1996 to 86 people who requested to be on the mailing list, relevant State and Federal Agencies, and landowners within the area.

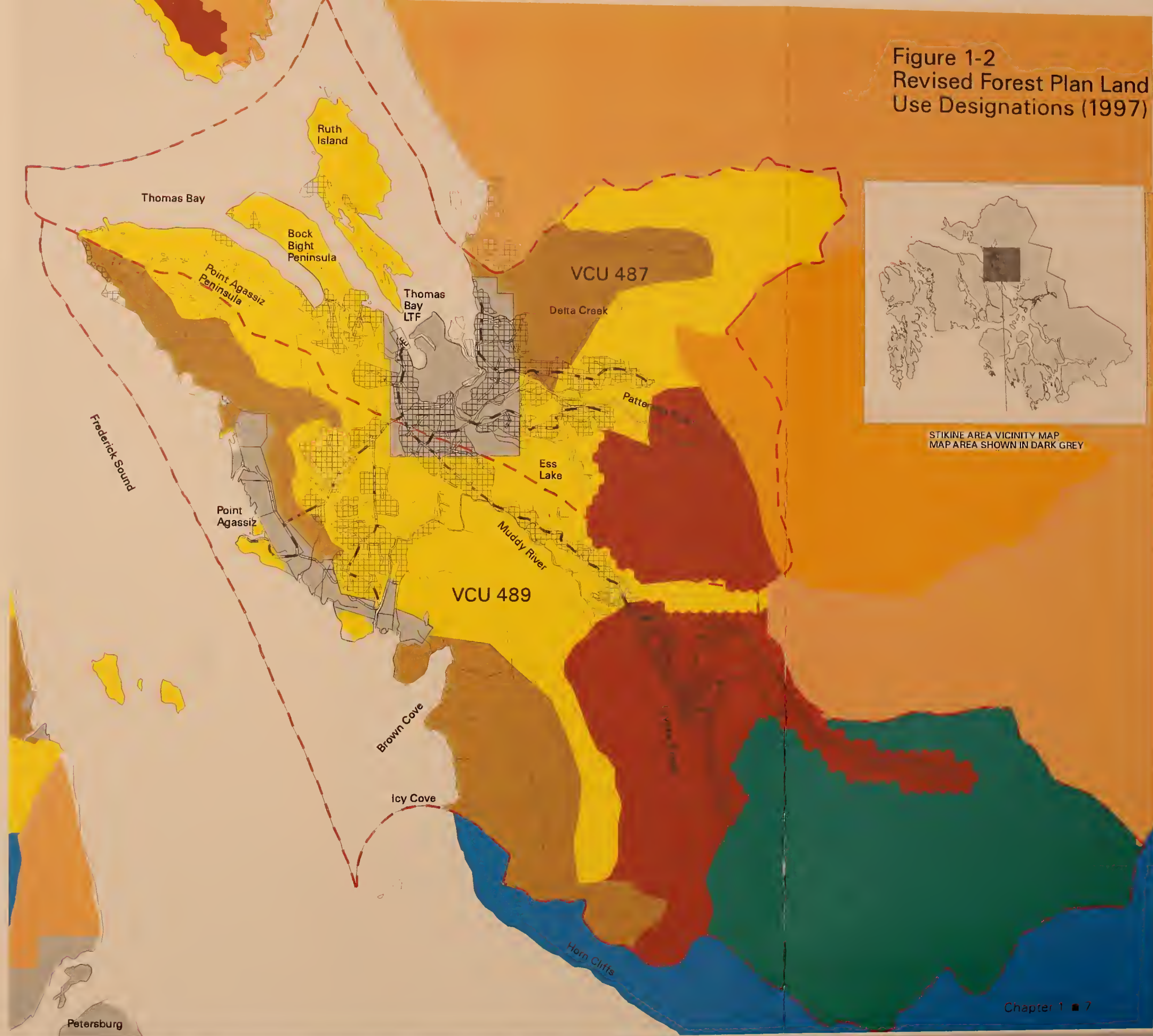
Informal contacts were made with local residents, workers, and hunters at the Thomas Bay Administrative Site from September 14 to September 16, 1996 (the beginning of moose hunting season). Open houses were held in Petersburg at the City Council Chambers and in Kake at the Community Center in November 1996. These open houses included a slide presentation of the area. Another slide presentation was given at a Petersburg Fish and Game Advisory Board meeting. The slide presentation was also shown to representatives from Alaska Department of Fish and Game and US Fish and Wildlife Service. A field trip was conducted to the project area with various members of State and Federal agencies. A Notice of Intent to prepare an environmental impact statement was published in the Federal Register on January 29, 1997 (Vol. 62, No. 19, pp.4245).

Comments to this DEIS will be addressed in the FEIS. Alternatives may be modified or added if necessary to incorporate additional concerns. Public meetings will be held after the DEIS is released to obtain comments and discuss the alternatives.

# Legend

- Wilderness
- Old-Growth Habitat
- Semi-Remote Recreation
- Special Interest Area (SIA)
- Modified Landscape
- Scenic Viewshed
- Timber Production
- Non-National Forest
- Crystal Creek Project Area Boundary
- Existing System Roads
- Existing Closed Roads
- Shoreline, Lakes, Class I/II Streams
- VCU Boundaries
- Saltwater
- Existing Managed Stands
- Log Transfer Facility (LTF)

Figure 1-2  
Revised Forest Plan Land  
Use Designations (1997)



0 7920 15840  
Scale is 1 inch = 7920 feet

/gis/projects/crystal/plots/deisplots2/tlmpix.map 09/25/97







## **Issue Development**

Comments made in response to the scoping document and at the public meetings were used to determine the significant issues.

## **Alternative Development**

Alternatives to the proposed action were based on issues. Where feasible several issues were combined to form an alternative. Chapter 2 has more discussion about the alternatives.

## **Significant Issues**

A significant issue provides the focus for one or more alternatives and can be used to compare alternatives. It does not relate to the number of people who made the comment.

Some concerns can be mitigated the same way and achieve the same impacts or lack of impacts in all alternatives. For example, buffer strips will protect fish habitat from the effects of timber harvest in all alternatives. The analyses on these concerns are briefly discussed under Other Environmental Considerations.

Comments were received from individuals, organizations, and other Federal and State agencies. We analyzed the comments we received and grouped comments where appropriate. As a result of our analysis, we determined that the following five issues were significant and within the scope of the project. In formulating alternatives, we considered each of the significant issues and varied the way they were addressed in each alternative.

## **Issue 1 - Timber Management and Economics**

Timber harvest is permitted in most of the Crystal Creek Project Area in accordance with the Forest Plan.

**Issues** - What are the current economics of the timber harvest? What opportunities are there for sales to small operators? What alternative (to clearcutting) silvicultural methods are feasible using standard logging systems? What is the effect on the volume class distribution?

**Comments** - Many people requested that timber offerings be economically feasible. They would like the timber offered from the project area to be made available to local small operators. A number of people supported the management of commercial second-growth timber, but some were concerned that old growth will be cut in order to make the management of second-growth profitable.

People have expressed an interest in not harvesting any more of the highest volume stands (Volume Class 6 and 7) in the Thomas Bay/Point Agassiz area. The extensive use of alternative silvicultural methods (instead of clearcutting) was recommended by many people.

**How these comments were incorporated into alternatives** - Single-tree selection and group selection were used where feasible and to address other resource concerns. Alternative 5 was designed to harvest timber from the existing road system to provide more opportunities for small operators. Alternative 3 avoids harvest in volume class 6 and 7 stands in the Point Agassiz area. Alternatives 2 and 5 propose ground-based

# **1 Purpose and Need**

logging systems only while Alternatives 3 and 4 include helicopter logging. All alternatives have identified second-growth stands with the opportunity for timber for management. No commercial thinning harvest was considered at this time.

## **Units of measure for this issue -**

Net board feet of sawtimber and utility volume harvest. (Cubic feet volume is also shown in accordance with the Forest Plan.)

Acres harvested by silvicultural method.

Acres harvested by volume strata (volume class is also shown because of public comment).

Opportunity for small sales.

Acres of second-growth timber treated.

## **Issue 2 - Moose Management**

The Crystal Creek Project Area is an important moose hunting area. The moose population increased after clearcutting occurred during the 1960s and 1970s. As the trees in clearcuts grow, understory forage is shaded out, and moose habitat declines.

**Issue -** How can the moose habitat be managed through time to provide a continuing supply of forage and winter habitat capable of sustaining a huntable moose population?

**Comments -** The public generally supported management of moose habitat but some did not want to see vegetation management done at the expense of other species. Some people asked whether clearcutting was really the best method to achieve forage production. The management of second-growth timber to provide forage areas was mentioned as an option.

**How these comments were incorporated into alternative development -** Alternative 2 was designed to implement a timber harvest strategy that would sustain the forage and winter habitat needs for moose through much of the project area. Other alternatives met the long-term habitat needs of moose by various degrees.

## **Units of measure -**

Percent Change in Estimated Moose Habitat Capability (from present to 2010).

Amount of acres of high-forage openings created by logging relative to the 20-year harvest rate suggested by the moose model by alternative by moose habitat management area.

## **Issue 3 - Biodiversity**

Biological diversity is defined as the distribution and abundance of different plant and animal communities and species within the project area.



**Issue -** How will timber harvest affect viable populations of species, highest-volume-unlogged-forests, loss of structural diversity, and early forest successional habitats with high shrub and forb production?

**Comments -** Viability for all species should be maintained. Habitat should be maintained for species that use old growth. Old growth reserves as proposed by the Forest Plan should be provided. Additions to the Forest Plan small old-growth reserves were proposed. Concern was expressed that increased access could lead to overhunting of the Horn Cliffs mountain goat population. The U. S. Fish and Wildlife Service has a concern about the effects of increased road density on wolves.

**How these comments were incorporated into alternative development -** The Interdisciplinary Team (IDT) proposed modifications to the Forest Plan old-growth reserves to make the boundaries identifiable on the ground and to meet the Plan's criteria (Forest Plan, Appendix K). These adjustments are not expected to require a significant Forest Plan amendment (Forest Plan, 3-82). Alternative 3 incorporates the proposed modifications to the old-growth reserves recommended by the U. S. Fish and Wildlife Service and the Alaska Department of Fish and Game to protect Volume Class 6 and 7 stands in the Point Agassiz area. This modification may require a significant or non-significant amendment to the Forest Plan (Forest Plan, 5-3). Clearcutting with reserve trees will retain about 15% of the forest to provide a old-growth legacy in the resultant stand. A public road closure during timber harvest operations was proposed at the crossing of Muddy River to the Crystal Creek drainage to help protect the Horn Cliffs mountain goat population and wolves. Alternative 4 used widely spaced, small group selection openings to resemble natural wind disturbance patterns. Single-tree selection was used in volume class 6 and 7 stands in the Point Agassiz area to maintain old-growth habitats.

**Units of measure -**

Acres of old-growth by volume class 6 and 7 maintained for the life of the project, maintained indefinitely, and modified by harvest.

Acres of productive old-growth by volume class maintained indefinitely.

Number of animals that the habitat of the project area is capable supporting for selected MIS by alternative over time.

Changes in numbers of animals for subsistence use.

Miles of road per square mile to determine the effect on animals sensitive to hunting and trapping.

Changes in access to Horn Cliffs mountain goat population.

# **1 Purpose and Need**

## **Issue 4 - Recreation**

One of the major recreational uses is for moose hunting in the fall. Other occasional uses include: bicycling the existing road system, sightseeing, camping, and freshwater fishing.

**Issue** - How will the current recreation opportunities change with timber harvest and associated new roads, and should there be any new recreation developments?

**Comments** - Comments varied as to whether or not recreation opportunities should be increased. Some people were against more development (timber harvest and new roads) and wanted primitive areas maintained with scenic values protected. People also commented that they would like to see improved recreation facilities and a broader range of recreation opportunities. Several moose hunters expressed a concern that increased trail access in the Patterson River area would lead to hunter congestion, potential safety issues, and restrictions on hunting near the trail; other people thought that a trail could easily and inexpensively be constructed.

**How these comments were used in developing alternatives** - The log transfer facility (LTF) is being redesigned to provide better docking for small boats and floatplane access in all action alternatives (Appendix C). A three-sided shelter and access trail are proposed for Alternatives 2 and 5. Scenic values are maintained from viewpoints in Thomas Bay, Patterson River, and Frederick Sound in all action alternatives. Trail opportunities in the Patterson River area were identified but not proposed.

**Units of measure** -

Number of developed recreation opportunities.

Number of acres that change from semi-primitive to roaded areas.

Number of harvested acres that will be seen from visual priority travel routes and other use areas and the amount of impact on the landscape.

## **Issue 5 - Transportation**

The Thomas Bay road system was constructed during the 1960s and 1970s for timber harvest. The road system is not connected to a community but serves the residents of Point Agassiz, a gravel operation, and recreationists. About half of the system is currently drivable by high-clearance vehicles. Portions have been made impassable by erosion and closure by brush.

**Issue** - How will the proposed timber harvest influence the maintenance and extent of the road system?

**Comments** - Comments were received against building any new roads in the area. Others wanted existing roads and proposed roads maintained for public use. Some wanted to use the original LTF site, while others recommended that other sites be examined for an LTF. The possibility of using barges instead of towing rafts was mentioned. One person did not want roading across the northern portion of the Point Agassiz Peninsula because it was a unique geologic formation. Concern about a possible conflict between the current gravel operation and the log transfer facility was noted.



**How these comments were used in developing alternatives -** The IDT developed Road Management Objectives (Appendix B) for all roads in the project area in consultation with the U. S. Fish and Wildlife Service and the Alaska Department of Fish and Game with the intent of maintaining the current level of use. All new roads will be closed to public use after harvest. Roads into Crystal Creek drainage will be closed to public motorized use during harvest operations. The road that parallels the Muddy River will be reconstructed in all action alternatives. Four miles of existing temporary roads are planned for closure. Alternative 5 was developed to minimize building new roads. Alternative designs of the LTF are presented to show opportunities (Appendix C).

**Units of measure -**

Number of miles of existing road and new road by alternative.

Number of miles of road to be left open after harvest.

## **Other Environmental Considerations**

There were many concerns raised during the public scoping and analysis that are not being treated as significant issues because they are mitigated in the same way in all alternatives or are not significantly affected by any alternative. These are discussed briefly at the end of Chapter 3 after the discussion of the effects of the significant issues.

**Air quality -** No significant impact will occur by the implementation of this project to air quality within the project area. Minor amounts of particulates will be released with logging equipment exhaust and dust associated with logging operations.

**Soils, Hydrology, and Fisheries -** Mitigation measures including no-harvest buffers will be used to prevent significant impact to the water quality and fisheries habitat.

**Heritage Resources -** A cultural resource survey was conducted and all sites will be avoided in accordance to law. We will coordinate with the State Historical Preservation Officer.

**Karst and Caves -** No karst or cave features were found in the project area.

**Lands -** Timber harvest activities may affect the private landowners in the area by increased traffic. Logging operations will not block existing roads.

**Minerals -** This project will not affect any mineral operations or future development in the area.

**Threatened, Endangered, and Sensitive (TES) Animals and Plants -** No significant impacts are expected to occur to TES animals. No sensitive plants were found during surveys. A biological evaluation was done in accordance with the Memorandum of Understanding with the U. S. Fish and Wildlife Service.

**Wetlands -** Impacts to wetlands will be minimized through road location and unit design.



## **Comments Outside the Scope of This Project**

Some comments received during scoping are not specific to this project or are part of decisions at a higher level. These comments are acknowledged and are addressed below:

1. Identify and evaluate potential consequences of the project outside project area boundaries, such as air and water quality at timber processing facilities.

The Forest Service does not regulate the processing of products removed from the National Forest other than by requiring primary processing within the State of Alaska unless an export permit is obtained. Any wood processing plant which receives National Forest timber must comply with State and Federal regulations governing air and water quality. Federal regulations are under the jurisdiction of the US Environmental Protection Agency.

2. Forest Service should develop and manage a centrally located log sort yard. Explore idea of a sortyard to make harvested logs available to local population.

The Forest Service does not normally sell harvested timber, because it would be in competition with local timber operators. The project will make a sort yard site available for use by timber sale purchasers.

3. The Forest Service, Narrows Conservation Coalition, and the Southeast Alaska Conservation Council should host log home building workshop to encourage use of second growth timber locally.

Although there may be interest in such a workshop, it is not connected specifically to this project. This comment has been directed to our Rural Community Assistance Coordinator and the State and Private Forestry branch of the Forest Service.

4. Skeptical of the deer and moose pellet counts in the Thomas Bay Partial Harvest Study. A peer review by other biologists was suggested.

These study results are preliminary but are being distributed to other biologists in Southeast Alaska. Several field trips have been made to visit the site with biologists from other agencies. Further monitoring of the study site is warranted. All the wildlife data cited in this EIS is available for public review.

5. Crabbers may be affected by hauling log rafts through crabbing area.

The existing sand and gravel operation, which ships from the Thomas Bay Log Transfer Facility (LTF) uses a barge with a 60 foot beam. Similar width barges could be used for transporting logs. The turning radius of log barges will be similar to the gravel barges currently in use. Therefore, no additional impacts are expected.

Log rafts are generally 66 feet wide and will require a larger turning radius. Crab pots within 400 feet of the LTF or ones located within the turning radius of the log rafts at the southeast corner of Ruth Island may be affected. Any

possible affect will be minimal since rafts will use a similar channel width as the current gravel operation.

The decision of whether to use barges or rafts to transport logs will be made by the U. S. Army Corps of Engineers. Thus, this decision is out of the scope of this document.

6. Concern about falldown volume (on-the-ground inventory vs. Forest Plan estimates).

Falldown is considered during the determination of the ASQ for the Forest Plan (Forest Plan FEIS, Appendix B). Field verification of tentatively suitable forested land will be used to modify the Allowable Sale Quantity for the next revision.

7. If the Forest Plan is adopted as proposed you could seriously reconsider the 16 MMBF due to the drastic measures required for stream protection (i.e. buffers, riparian zones, windfirmness).

Standards and guidelines from the Forest Plan are incorporated into the design of the alternatives for the Crystal Creek Timber Harvest. The volume for the proposed action was determined with the standards and guidelines in mind.

8. Ecosystem management requires an approach to planning that examines an area to determine what level of harvest the ecosystem can support without undue stress prior to setting a timber harvest target. As long as timber production targets drive the planning process, we believe ecosystem management will be an elusive goal.

The volume for the proposed action was determined after a preliminary analysis of the area occurred. If the volume is found to be too low or too high after a full analysis, the proposed action can be adjusted and a new alternative could be designed.

## **Agency Coordination**

We received numerous comments about the content of the DEIS. In the interest of making a short, concise readable document as requested by the public and as required by 40 CFR 1502, Chapter 3 contains the summary of the analysis. Chapter 2 and the Unit cards (Appendix B) explain the mitigation measures used to design the units. More complete information can be obtained by contacting the Petersburg Ranger District.

## **Approval Required from Other Agencies**

The Forest Service is responsible for coordinating the review of the project by several other agencies. The purpose of these reviews is often to seek their professional point of view on topics in which they have expertise. In some cases, the reviews are necessary because another agency has authority to issue permits for specific proposed activities. Below, we have described our relationship to other agencies in the planning of this document.



# **1 Purpose and Need**

## **US Army Corps of Engineers (COE)**

A single permit from COE incorporates requirements for the Clean Water Act and the Rivers and Harbors Act. It also includes US Environmental Protection Agency (EPA) permits for pollution discharge elimination and spill prevention control and countermeasure. This permit covers the Alaska Department of Environmental Conservation (DEC) Certificate of Reasonable Assurance for compliance with State water quality standards. This permit covers the Thomas Bay LTF.

All roads, landings, and rock pits will be designed to the minimum standards needed for timber harvesting and other silvicultural activities. These will be constructed and/or reconstructed in accordance with BMPs listed in 33 CFR 323.4(a) (6). No permits are needed under Section 404 of the Clean Water Act.

## **Alaska Division of Governmental Coordination (ADGC)**

A review coordinated through ADGC will determine if the State agencies agree with the Forest Service's determination of consistency with the Alaska coastal management program. A State tidelands easement for the use of the area has been obtained.

### **Revised Forest Practices Act 1990**

The Revised Forest Practices Act affects National Forest management through its relationship to the Alaska Coastal Management Program and the Federal Coastal Zone Management Act.

The Revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency to the maximum extent practicable with the Alaska Coastal Management Program. The Act recognizes that consistency is attainable for timber harvest on federal land using procedures different from those required by the Act or its implementing regulations.

The Forest Service is currently working with the Alaska State Division of Governmental Coordination on a revision of the agreement between the State and the Forest Service. This revised agreement will establish the policies and procedures for coordinating State review of Forest Service programs and activities.

### **Coastal Zone Management Act of 1976**

All alternatives will be in compliance with the Coastal Zone Management Act. This Act requires federal agencies to ensure that activities or developments are consistent with approved state coastal management programs to the maximum extent practicable. The Alaska Coastal Management Act of 1977 contains the standards and criteria for a determination of consistency for activities within the coastal zone.

A Memorandum of Understanding between the State of Alaska and the Regional Forester, dated October 8, 1981, outlines standards against which the consistency evaluation will be made. The following standards are included in the agreement:

- Alaska Statute Title 46, Water, Air, Energy, and Environmental Conservation;
- Alaska Forest Practices Act of 1990; and
- the District Coastal Management Program.



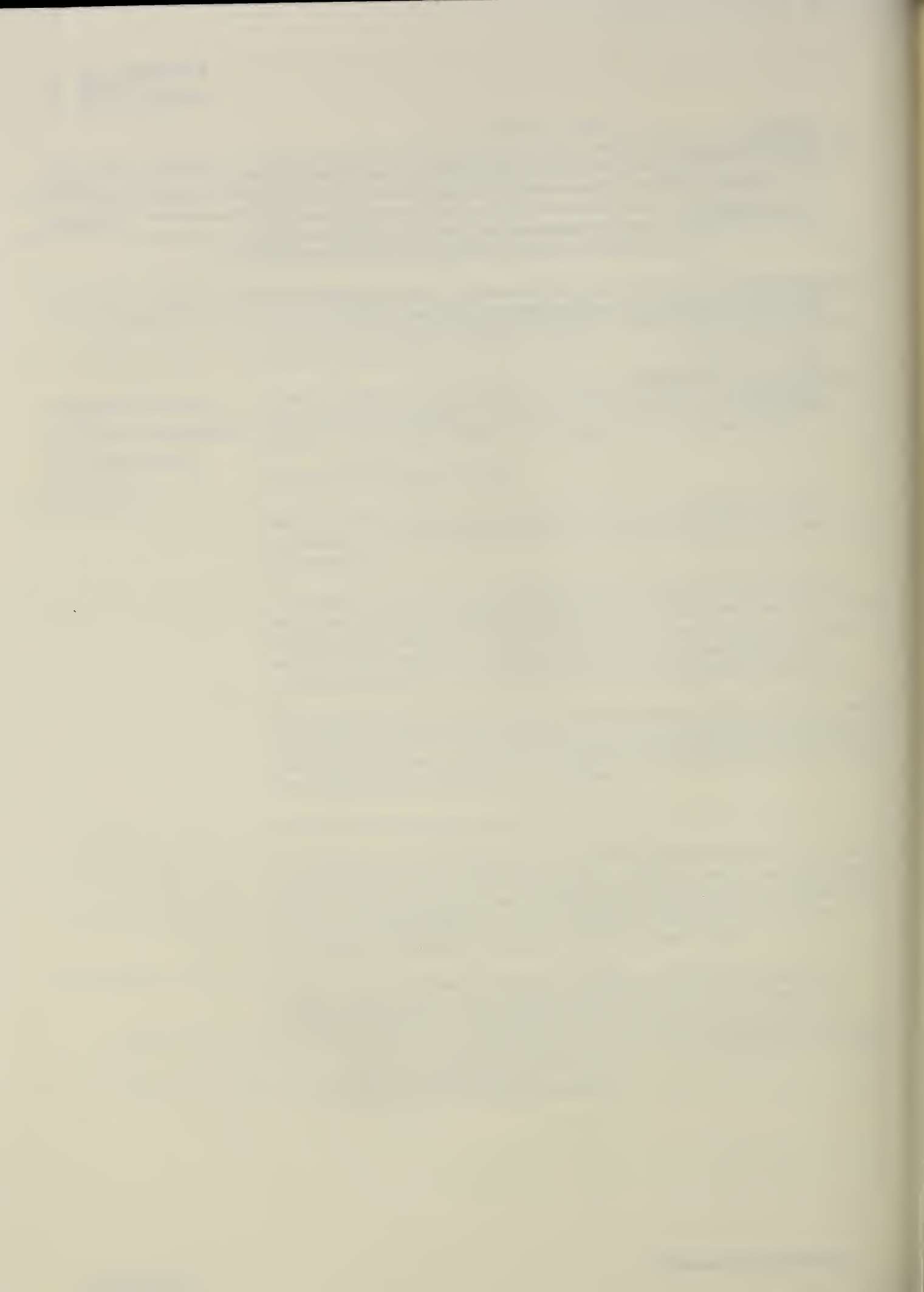
**Alaska  
Department of  
Environmental  
Conservation**

**Clean Water Act**

All proposed alternatives are in compliance with the Clean Water Act. The Clean Water Act of 1972, as amended in 1977, directs all federal agencies to comply with all federal and State water quality regulations. A 1992 Memorandum of Agreement between the Alaska Department of Environmental Conservation and the Forest Service, Alaska Region outlines the Forest Service responsibilities.

**US Fish and  
Wildlife Service  
and National  
Marine Fisheries  
Service**

Biological Assessments which assess the status and project impacts on the wildlife species of concern, have been reviewed and approved by the both agencies.



# **Chapter 2**

## **Alternatives**



# 2 Alternatives

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# Chapter 2

## Alternatives

This chapter summarizes the development of alternatives to meet the Purpose and Need as described in Chapter 1. The action alternatives selected for this timber sale, as well as the no action alternative, are discussed, compared, and evaluated. This chapter presents the following information:

- alternative development,
- alternatives considered but eliminated from detailed study,
- design elements common to all action alternatives,
- descriptions of alternatives,
- a summary comparison of alternatives presented in table format, and
- mitigation and monitoring measures.

### Alternative Development Process

A group of resource specialists known as the interdisciplinary team (IDT) design alternatives that provide different approaches to meet the purpose and need and that address the major issues raised in the scoping process. For example, one alternative emphasizes moose management, and another alternative limits the amount of new road construction. Alternative considerations include identification and discussion of alternatives eliminated from detailed study.

When developing alternatives, the IDT used comments and concerns expressed by the public. (See Public Involvement, Chapter 1.) These comments were consolidated into major issues. The IDT then developed strategies that could be used to address these issues while meeting the purpose and need. The IDT determined units of measure to compare the alternatives and measure the effects of each.

Sources of information, including computer based resource map inventory, aerial photo interpretation, and integrated field reconnaissance and data collection, were used for identifying potential areas to harvest timber and build roads. Maps were produced that displayed areas of productive timber, soils unsuitable for timber harvest, streams, and other resource characteristics. A logging system and transportation analysis (LSTA) was designed from this information to include all tentatively suitable timber. Field reconnaissance is ongoing between draft and final environmental impact statements and will further modify the data bases and update the LSTA.



## 2 Alternatives

Each alternative presented in the Draft Environmental Impact Statement (DEIS) is a different response to the issues of concern discussed in Chapter 1. For the DEIS, four action alternatives were designed to explore ways to address and resolve issues of public concern. Each alternative represents a site-specific mix of proposals that respond to these issues. From this range, the Forest Supervisor has a basis for judging the tradeoffs between implementing each alternative including the no-action alternative.

### Alternatives Considered but Eliminated from Detailed Study

The IDT considered a broad range of alternatives. Some of these were dropped from further analysis before a reasonable set of alternatives was considered for detailed study. Those alternatives eliminated are discussed in this section. Eliminating these alternatives from this analysis does not eliminate the areas from future consideration.

#### Harvesting Timber in the Headwaters of the Muddy River

The IDT considered harvesting timber in the headwaters of the Muddy River but eliminated this area from further study due to both economic and resource considerations. In order to harvest timber in the headwaters of the Muddy River, a high number of road miles would have to be constructed. Harvest units were not needed to create moose forage since there are units near the upper watershed that are still providing moose forage.

#### Harvesting Timber North of the Patterson River

Most of the commercial timber was harvested during the 1960s and 1970s. Not enough timber remains to warrant construction of the transportation system. Future timber harvest is planned in this area after the young-growth timber becomes large enough to harvest commercially.

#### Harvesting Timber in the East Fork of Crystal Creek

The IDT considered harvesting timber in the East Fork of Crystal Creek area but eliminated this area from further study. Road construction and helicopter logging of this area would be more cost effective after initial road construction occurs as a first entry. Once a road is constructed, harvest options may be possible in this area.

#### Harvesting Timber in the Upper Patterson River

The IDT considered harvesting timber in the Upper Patterson River area but eliminated this area from further study. Road construction and helicopter logging of this area would be more cost effective after initial road construction occurs as a first entry. Once a road is constructed, harvest options may be possible in this area.

#### Harvesting Timber on Ruth Island, Bock Bight Peninsula, and Point Agassiz Peninsula

Much of this area is within land designated by the Forest Plan as unsuitable for timber harvest, such as beach and riparian buffers and an old growth reserve. Most of the timber occurs in scattered low-volume stands. A comment from the public indicated that Point Agassiz was part of a unique geological feature (glacial moraine) and should not be roaded.

Ruth Island would be difficult to log due to the terrain. Nearly all of Ruth Island is within beach or riparian buffers. The access to the remaining timber is marginal.



## Design Elements Common to All Action Alternatives

<b>Beach and Estuary Buffers</b>	No-cut buffers of 1000 feet will be around all estuaries and along the shoreline in accordance with the Forest Plan.
<b>Cultural Resources</b>	All known or discovered cultural sites will be protected as required by statute. Timber sale contract provisions will require immediate protective measures if additional sites are discovered during timber harvesting and road construction operations.
<b>Logging Camps</b>	Land will be made available for logging camp(s) as needed.
<b>Reserve Trees and Snag Retention</b>	About 15% of the existing trees will be retained in all clearcut harvest units. About 70% of these trees will be left in clumps. These trees will be left to provide structural diversity for wildlife and an old-growth legacy for the future stand. Where feasible, snags would be retained in all harvest units to provide wildlife habitat and a future source of downed woody material. Decaying woody material adds nutrients to the soil and provides wildlife habitat.
<b>Road Location</b>	Roads were located using Best Management Practices, a system of practice or methods that are designed to reduce or prevent water pollution. BMPs are used to minimize impacts to wetlands, erodable soils, and water resources. Road locations avoid landslide prone areas. Roads will be located on footslopes through noncommercial forest land to avoid construction in open muskeg. Stream crossings are located perpendicular to the channel to minimize the amount of clearing within the stream influence. Full bench construction and end hauling of excavated material will be required on designated areas to minimize soil erosion and to prevent sediment from entering streams (Road Descriptions, Appendix B). Material endhauled during road construction will be placed on stable areas away from flowing water. Existing roads are used to minimize new road construction. Road reconstruction is planned for portions of Road 6256.
<b>Sort Yards</b>	One area for log sorting has been identified. BMPs will be followed to minimize soil and water resource impacts from the sort yard.
<b>Stream Buffers</b>	<p>The Tongass Timber Reform Act (TTRA) requires a no-harvest buffer zone of no less than one hundred feet in width on each side of all Class I streams and on those Class II streams which flow directly into Class I streams. In addition, the Forest Plan prescribes varying Riparian Management Areas for all Class I, II, and III streams.</p> <p>BMPs will be prescribed and implemented to minimize risk that land management activities will impair water quality.</p>
<b>100 Acre Opening Limitations</b>	No alternative creates harvest openings that exceed 100 acres, in accordance with the Alaska Regional Guide (USDA Forest Service, 1983) and 36 CFR 219.27.

## 2 Alternatives

### Alternatives Considered in Detail

The IDT developed a proposed action based on preliminary scoping and management direction to meet the purpose and need. This proposed action is not necessarily the preferred alternative. After public scoping, the IDT developed alternatives in addition to the proposed action for detailed analysis. These four action alternatives address the purpose and need and respond to resource concerns and scoping comments. Each action alternative provides a mix of resource use and protection, emphasizing different resource values based on the theme for which the alternative was developed. The no action alternative proposes little change in the present management.

Alternative maps (Figures 2-1 to 2-5) display general size and location of proposed harvest units and road locations. Timber volumes presented for each of the action alternatives are based upon current information. Table 2-1 summarizes how each alternative responds to the significant issues.

#### **Alternative 1 No Action**

This alternative proposes no additional commercial timber harvest or road construction in the Crystal Creek Project Area at this time. Management activities, such as second-growth management, road maintenance, free-use timber, and existing recreational developments will remain at current levels.

Alternative 1 shows the small Old-Growth Reserves (OGRs) as designed by the Forest Plan.

#### **Alternative 2 Proposed Action**

The level and timing of the timber harvest is designed to sustain a balance between high production forage and moose winter habitat. Openings to produce forage for moose would be created by clearcuts with reserve trees and group selection. Where possible, harvest openings will be made in lower volume timber stands to minimize impact on the winter habitat. Moose winter range habitat needs will be met by forest not available for harvest and forest designated for single-tree selection harvest. Thinning and pruning of existing second-growth timber would be emphasized to prolong moose forage production. A three-sided recreation shelter and associated trail is proposed for the north end of Ess Lake.

Alternative 2 shows the OGRs proposed by the IDT. Minor modifications were made to the Forest Plan designs to be able to identify them on the ground. Boundaries used included streams, large muskegs, land ownership boundaries, and existing clearcuts. In addition, about 800 acres was added to the reserve north of the Patterson River to meet Forest Plan criteria. This would be a non-significant Forest Plan amendment.

## Alternative 3

This alternative focused the timber harvest within the Timber Production and Modified Landscape LUDs and avoids timber harvest in the Point Agassiz area which was included in the U. S. Fish and Wildlife Service recommendations for old-growth habitat reserves. Helicopter logging is used to access timber where roads can not be constructed using standard specifications.

The size of the small OGR in the Point Agassiz area more than doubled (from 2,500 acres to 5,600 acres) following recommendations from U.S. Fish and Wildlife Service and Alaska Department of Fish and Game. This may be a significant Forest Plan amendment. The small OGR at Brown Cove has increased by about 100 acres following their recommendations. The small OGR north of the Patterson followed modifications by the IDT as described in Alternative 2.

## Alternative 4

This alternative attempts to mimic the natural openings caused by wind disturbance. Approximately 10% of the area within selected units will be harvested in small, dispersed groups to resemble natural gaps in the canopy. Opening size will be limited to less than one acre where feasible. Additional harvest using clearcut with reserve trees and more intensive group selection would help meet the objectives of timber harvest and moose forage production. Helicopter logging is used to access timber where roads can not be constructed using standard specifications.

Small OGRs follow IDT modifications described in Alternative 2.

## Alternative 5

This alternative builds the least amount of road to meet the timber harvest objectives while minimizing resource concerns. This alternative responds to public comments requesting no new roads. A limited amount of road construction was proposed to disperse timber harvest to lessen impacts to wildlife, scenery, and recreation. Within the Point Agassiz area, extensive use of single-tree selection is proposed in volume class 6 and 7 stands to maintain old-growth habitat characteristics. A three-sided recreation shelter and associated trail is proposed for the north end of Ess Lake.

Small OGRs follow IDT modifications described in Alternative 2.



# 2 Alternatives

## Alternative Comparison

Table 2-1.

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
<b>Issue 1. Timber Management and Economics</b>					
Total volume harvested (MMBF)	0	15.145	18.054	16.274	13.896
(MMCF)	0	4.206	4.698	3.933	3.980
Acres harvested by silvicultural prescription					
Clearcut with Reserve Trees-85% Removal	0	608	523	570	330
Group Selection - 10% Removal	0	0	145	848	0
Group Selection - 30% Removal	0	310	679	116	47
Group Selection - 40% Removal	0	0	0	0	351
Single Tree Selection - 20% Removal	0	14	14	183	313
Single Tree Selection - (0%, 20%, 40%, 60%)	0	82	0	82	82
Acres harvested by volume strata					
Low	0	162	23	141	30
Medium	0	174	151	168	106
High	0	384	570	449	427
Acres harvested by volume class					
class 4	0	306	148	326	73
class 5	0	315	570	340	211
class 6 and 7	0	71	13	116	240
Opportunity for Small Sales (MMBF)					
(Acres)	0	1.9	0.1	1.9	7.5
	0	131	14	131	714
Acres of second-growth treatment recommended	1,720	1,720	1,720	1,720	1,720
<b>Issue 2. Moose Management</b>					
Percent Change in estimated moose habitat capability from present to year 2010					
Percent Change without thinning <sup>1</sup>	-20%	-17%	-17%	-17%	-18%
Percent Change with thinning <sup>2</sup>	-10%	-6%	-6%	-6%	-7%
Amount of high-forage openings created by logging relative to the 20-year harvest rate suggested by the moose model by alternative by moose habitat management area (percent) <sup>3</sup>					
West Muddy Moose Habitat Management Area <sup>4</sup>	0%	76%	0%	76%	91%
East Muddy Moose Habitat Management Area	0%	68%	65%	69%	14%
Patterson Moose Habitat Management Area	0%	106%	94%	60%	73%
Upper Muddy Moose Habitat Management Area	0%	44%	305%	106%	80%

<sup>1</sup> Without thinning assumes that no additional second growth treatments occur.

<sup>2</sup> With thinning assumes that about 1,720 acres of existing second growth will be thinned or pruned by year 2010 to prolong understory moose forage for an additional 20 years.

<sup>3</sup> A value much greater than 100% implies that it will be difficult to balance winter range and high-forage areas in the later stages of the timber harvest rotation within the Moose Habitat Management Area. A value much lower than 100% implies that the lack of high-forage habitat may soon limit moose numbers within the Moose Habitat Management Area without further logging or more intensified treatment of existing second growth.

<sup>4</sup> See the Moose Habitat Management Area Map (Figure 3-3) for the locations of the areas.

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
The estimated change in the number of moose harvested annually by Year 2010 (current annual average harvest is about 19 moose).					
Moose change without thinning <sup>5</sup>	-4	-3	-3	-3	-3
Moose change with thinning <sup>6</sup>	-2	-1	-1	-1	-1
<b>Issue 3 Biodiversity</b>					
Estimated acres of productive old-growth and percent of 1954 total left after timber harvest					
Acres	22,280	21,560	21,530	21,560	21,810
Percent of 1954 Total	81.9%	79.3%	79.1%	79.3%	80.2%
Estimated acres and percent of 1954 total volume class 6 and 7 old-growth modified by harvest, left after timber harvest, and outside the timber suitable for harvest					
Acres volume class 6+ modified by harvest <sup>7</sup>	0	114	14	292	549
Percent of 1954 total	0.0%	1.5%	0.2%	3.8%	7.1%
Acres of suitable <sup>8</sup> volume class 6+ left after harvest	1,080	966	528	788	531
Percent of 1954 total	14%	12%	6%	10%	6%
Acres of unsuitable <sup>9</sup> volume class 6+ left after harvest <sup>10</sup>	1,756	1,756	2,294	1,756	1,756
Percent of 1954 total	23%	23%	30%	23%	23%
Percent Change in the estimated deer habitat capability from Present					
By Year 2010 without thinning <sup>5</sup>	-1.9%	-3.3%	-3.7%	-3.4%	-3.3%
By Year 2010 with thinning <sup>6</sup>	-0.2%	-1.6%	-2.0%	-1.7%	-1.6%
By Year 2040	-2.8%	-4.8%	-5.1%	-5.0%	-4.7%
Percent Change in Estimated marten habitat capability from Present to Year 2040	0%	-2%	-2%	-2%	-2%
Percent Change in Estimated brown creeper habitat capability from Present to Year 2040 <sup>11</sup>	0%	-0.8%	-0.6%	-0.9%	-1.8%
Percent Change in Estimated wolf habitat capability from Present to Year 2040	0%	0%	0%	0%	0%

<sup>5</sup> Without thinning assumes that no additional second growth treatments occur.

<sup>6</sup> With thinning assumes that about 1,720 acres of existing second growth will be thinned or pruned by year 2010 to prolong understory moose forage for an additional 20 years.

<sup>7</sup> Volume class 6+ is used instead of high volume strata because of a public comment

<sup>8</sup> Tentatively suitable forest as defined by the Forest Plan includes productive forest that is physically suitable for timber harvest, can be adequately restocked in five years with adequate response information available, not withdrawn from timber production, and has been identified in the Forest Plan as suitable for timber management.

<sup>9</sup> Land on slopes greater than 72%, areas within riparian, beach, and estuary buffers are examples of areas not suitable forest land. The LUDs within the project area where timber harvest is suitable are: Timber Production, Modified Landscape, and Scenic Viewshed.

<sup>10</sup> The difference between Alternative 3 and the other alternatives reflect the effect of the Fish and Wildlife Service modifications to the Point Agassiz small reserve in protecting the highest volume old-growth.

<sup>11</sup> For the purposes of display, it is assumed that all proposed timber harvest will occur by 2000.



## 2 Alternatives

Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Estimated open road density (miles/square miles of project area) post-timber harvest with and without road closures <sup>12</sup> .					
With Road Closures (miles/square mile)	0.19	0.22	0.24	0.22	0.22
Without Road Closures (miles/square mile)	0.23	0.44	0.41	0.46	0.37
Acres of timber harvest in mountain goat winter range.	0	257	466	267	210
Shortest distance in miles between roads and the beginning of Horn Cliffs mountain goat hunting area <sup>13</sup> .					
Miles of Constructed roads	1.8	0.6	0.6	0.2	1.8
Miles of Roads open to public motorized traffic	3.0	2.2	2.2	2.2	2.2
Potential effects on Subsistence Use of Resources.					
The estimated subsistence demand may likely exceed habitat capability (significant possibility of significant restriction)					
Deer	No	No	No	No	No
Mountain Goats	No	No	No	No	No
Furbearers	No	No	No	No	No
Other Wildlife (not including moose)	No	No	No	No	No
Salmon and Finfish	No	No	No	No	No
Marine Invertebrates	No	No	No	No	No
Plants and other foods	No	No	No	No	No
Restrictions to existing access to subsistence resources are likely.	No	No	No	No	No
Increased Competition between users for subsistence resources is likely to result in restriction to current harvest seasons and bag limits					
Deer	No	No	No	No	No
Mountain Goats	* <sup>14</sup>	* <sup>14</sup>	* <sup>14</sup>	* <sup>14</sup>	* <sup>14</sup>
Furbearers	No	No	No	No	No
Other Wildlife (not including moose)	No	No	No	No	No
Salmon and Finfish	No	No	No	No	No
Marine Invertebrates	No	No	No	No	No
Plants and other foods	No	No	No	No	No

<sup>12</sup> All new roads and currently opened temporary roads are proposed to be closed. No alternative exceeds the U. S. Fish and Wildlife Service threshold-of-concern for wolves of 0.7 mile/square mile.

<sup>13</sup> The beginning of the Horn Cliffs goat hunting area is estimated to be the habitat above 2000 feet elevation on the Horn Mountains Range. A public closure of the road to motorized traffic will restrict motorized access into the Crystal Creek drainage in all alternatives.

<sup>14</sup> Motorized closure of the Crystal Creek Project Area roads to public access in Alternatives 2, 3, and 4 should adequately protect the Horn Cliffs goat population from overhunting. However, the possibility that overhunting would occur in these alternatives cannot be completely dismissed. The goat harvest is monitored annually by Alaska Department of Fish and Game. Further road closures and/or hunting restrictions might be necessary if overhunting were to occur. Under ANILCA, subsistence users would have a preference over non-subsistence users.



Units of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
<b>Issue 4. Recreation</b>					
Construction of three-sided shelter and trail at Ess Lake	0	yes	0	0	yes
Number of acres that change from Semi-Primitive to Roaded	0	5,135	4,688	5,171	1,547
Number of harvested acres seen from Visual Priority Travel Routes and other use areas.	0	150	120	100	121
<b>Issue 5 Transportation</b>					
Permanent Road construction miles	0	15.4	13.8	12.7	6.4
Temporary Road construction miles	0	6.0	4.7	10.6	9.2
Miles of road to be left open after harvest	17.2	19.9	21.5	19.9	19.9

## Identification of the Forest Service Preferred Alternative

No Preferred Alternative has been identified for the DEIS. The Deciding Official may select an alternative in its entirety or a combination during the decision. After reviewing the public comments on the DEIS, a selected alternative will be identified in the Record of Decision.

## Mitigation

The following mitigation measures would be required for implementing the project. For mitigation measures specific to each unit and road segment, see Appendix B, Unit and Road Descriptions. Maps at the end of Chapter 2 show general size and location of proposed harvest units.

### Heritage Resources

If cultural sites are discovered during project implementation, the district archaeologist will be consulted. Cultural resource sites will be protected with timber sale contract provisions.

### Water Quality and Fisheries

Pursuant to the Tongass Timber Reform Act of 1990 (TTRA), commercial timber harvesting would be prohibited within a buffer zone no less than one hundred feet in width on each side of all Class I streams (anadromous fisheries) and those Class II streams (resident fisheries) which flow directly into a Class I stream. To protect downstream water quality, Class III streams would receive protection through a combination of tree retention, directional felling of trees, suspension of logs, and split-yarding. The Forest Plan standards and guidelines for buffers on Class I, II, and III streams will be followed. Forest Plan standards and guidelines are more stringent than TTRA requirements.

Full bench construction and end hauling of excavated material would be required on designated areas to minimize soil erosion and to prevent sediment from entering streams (see Road Descriptions, Appendix B). Material endhauled during road construction will be placed on stable areas away from flowing water.

## 2 Alternatives

After use, temporary roads would be closed, water bars added at appropriate places, and drainage structures removed. Erosion control needed would be accomplished before closing roads.

Timing restrictions on in-stream road construction work would be implemented during critical periods to protect fishery resources (see Road Descriptions, Appendix B).

Stream crossings of Class I and II streams would be constructed to allow fish passage.

Temporary bridges will be used instead of small culverts to reduce soil disturbance and to protect fish passage when the road is closed.

### Wildlife

All timber harvest units in the selected alternative will be searched for raptor and marbled murrelet nests prior to implementation. If nests are found, habitat and timing restrictions will be established in accordance with the Forest Plan Standards and Guidelines.

Loss of old-growth habitat is mitigated by permanent retention of OGRs, riparian buffers, beach and estuary buffers. In addition, acres of varying volume classes not in the suitable timber harvest land base will be retained as old-growth habitat. Other methods used to mitigate against loss include single-tree selection, group selection, and retaining reserve trees within clearcut harvest units.

Thinning and pruning will be done where possible to maintain understory for wildlife forage in existing second-growth stands.

In accordance with the Forest plan, buffers of 330 feet have been designated around wetlands where waterfowl nesting and brood-rearing is likely. Within this buffer, harvest is generally limited to single-tree selection, group selection of 1/2 acre or less, and salvage logging of downed trees. Timing clauses during April 1 to July 31 will be adhered to limit logging activities. Some large -diameter trees will be topped to provide for future nest sites. Snag and replacement snag retention will be emphasized.

The Muddy River crossing into the Crystal Creek drainage will be closed to public motorized use during logging activities to limit increased harvest of the Horn Cliffs mountain goat population and trapping of wolves. Any new roads constructed into the Crystal Creek drainage or the Ess Lake area will be closed after timber harvest is complete.

Helicopter overflights of goat spring and summer range during logging operations will be restricted in the Upper Muddy and Crystal Creek drainages. Forested travel corridors will be maintained to allow goat movement in the Crystal Creek and Upper Muddy River drainages.

## Monitoring

Implementation monitoring is used to ensure that the project proceeds as it was designed in the environmental analysis document. This includes a check on unit design, silvicultural prescriptions, and mitigation measures. Effectiveness monitoring will be conducted to see if the mitigation measures and guidelines were successful in meeting resource objectives of the Crystal Creek Timber Harvest. Validation monitoring reviews models to see if the model was accurate in its assumptions.

### Implementation Monitoring

#### Sale Preparation

The IDT prepared unit cards for each harvest unit (see Appendix B). Unit cards include a unit map and a narrative explaining their concerns and how the concerns could be addressed in the design of each unit. Road Management Objectives are developed for each road. From these two documents, Forest Service personnel experienced in sale preparation and road design prepare a timber sale that reflects the mitigation measures prescribed by the IDT. During this phase, minor changes may be made to reflect the mitigative measures. This preparation step would involve a “plan-in-hand” review of the timber sale by the IDT to ensure that planned project elements have been incorporated.

#### Sale Administration

Implementation monitoring continues through harvest and contract inspections by trained sale administrators and road inspectors as a routine part of project implementation. Through provisions contained in the timber sale contract, sale administrators and road inspectors ensure that the prescriptions contained on the unit and road cards are implemented. Sale administrators and contract inspectors have the authority to initiate action to repair resource damage and suspend operations until problems have been corrected. This process ensures that project elements are implemented as designed and that standards and guidelines are implemented.

### Effectiveness Monitoring

Only project-specific effectiveness monitoring is included in this document. Regular programmatic monitoring done at the District or Forest level will be done on a regularly scheduled basis.

#### Timber Restocking

**Objective:** Ensure that restocking occurs within minimum timeframes stated in the National Forest Management Act.

**Method:** Conduct stocking surveys 3 and 5 years after harvest.

**Action:** Determine if stocking is adequate. Prescribe planting if natural regeneration is inadequate.

**Responsible Staff:** District Silviculturist



## 2 Alternatives

### Wildlife Harvest

**Objective:** Determine if changes occur in the harvest rates of goats, moose, deer, marten, and wolves within the project area and within the Horn Cliffs goat population.

**Method:** Annually review Alaska Department of Fish and Game harvest data to determine harvest rates of the above populations. Coordinate with Alaska Department of Fish and Game to identify what portion of the successful Horn Cliff population goat hunters are using roads within the project area for access.

**Action:** If harvest of any of the above wildlife populations appear to be excessive, work with Alaska Department of Fish and Game to determine if changes are needed in road management or hunting regulations.

**Responsible Staff:** District Wildlife Biologist

### Single-Tree Selection Harvest

**Objective:** Determine the effects of single-tree selection harvest in Units 12 and 15 on understory forage and winter use by moose and deer.

**Method:** Establish understory vegetation plots and conduct spring pellet counts in these units prior to harvest. Resample for understory vegetation and spring pellet-group densities approximately 3 and 7 years after logging.

**Action:** Analyze and publish the results. Determine if further monitoring is warranted.

**Responsible Staff:** District Wildlife Biologist

### Validation Monitoring

Validation monitoring is conducted to check on assumptions made about resource effects and is usually carried out at the regional level. The only validation monitoring planned at this time for the Crystal Creek timber sale is for cultural resources.

### Cultural Resources

**Objective:** Validate assumptions of cultural resources probability model.

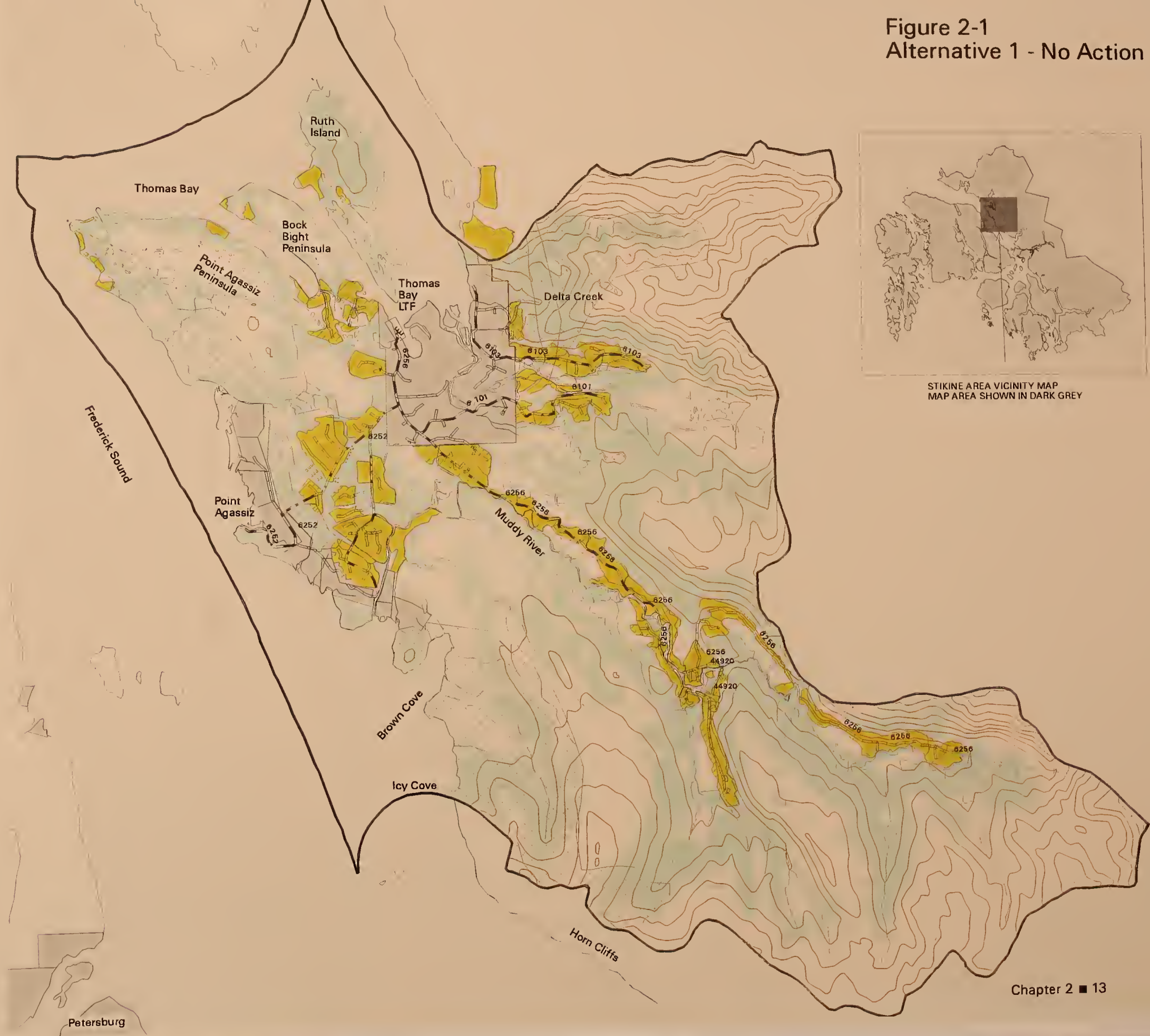
**Method:** Field observations of ground disturbance along reconstructed and newly constructed roads.

**Action:** Report if impacts occurred to cultural resources. Determine if assumptions of cultural resources model require adjustment.

**Responsible Staff:** District Archaeologist

Figure 2-1  
Alternative 1 - No Action

- Legend**
- Crystal Creek Project Area Boundary
  - Existing System Roads
  - Existing Closed Roads
  - Shoreline, Lakes, Class I/II Streams
  - Contour Interval 500 ft
  - Saltwater
  - Wilderness
  - Non-National Forest Lands
  - Proposed Thinning Units
  - Old Growth Reserves
  - Existing Managed Stands
  - Volume Class 4 +
  - Log Transfer Facility (LTF)



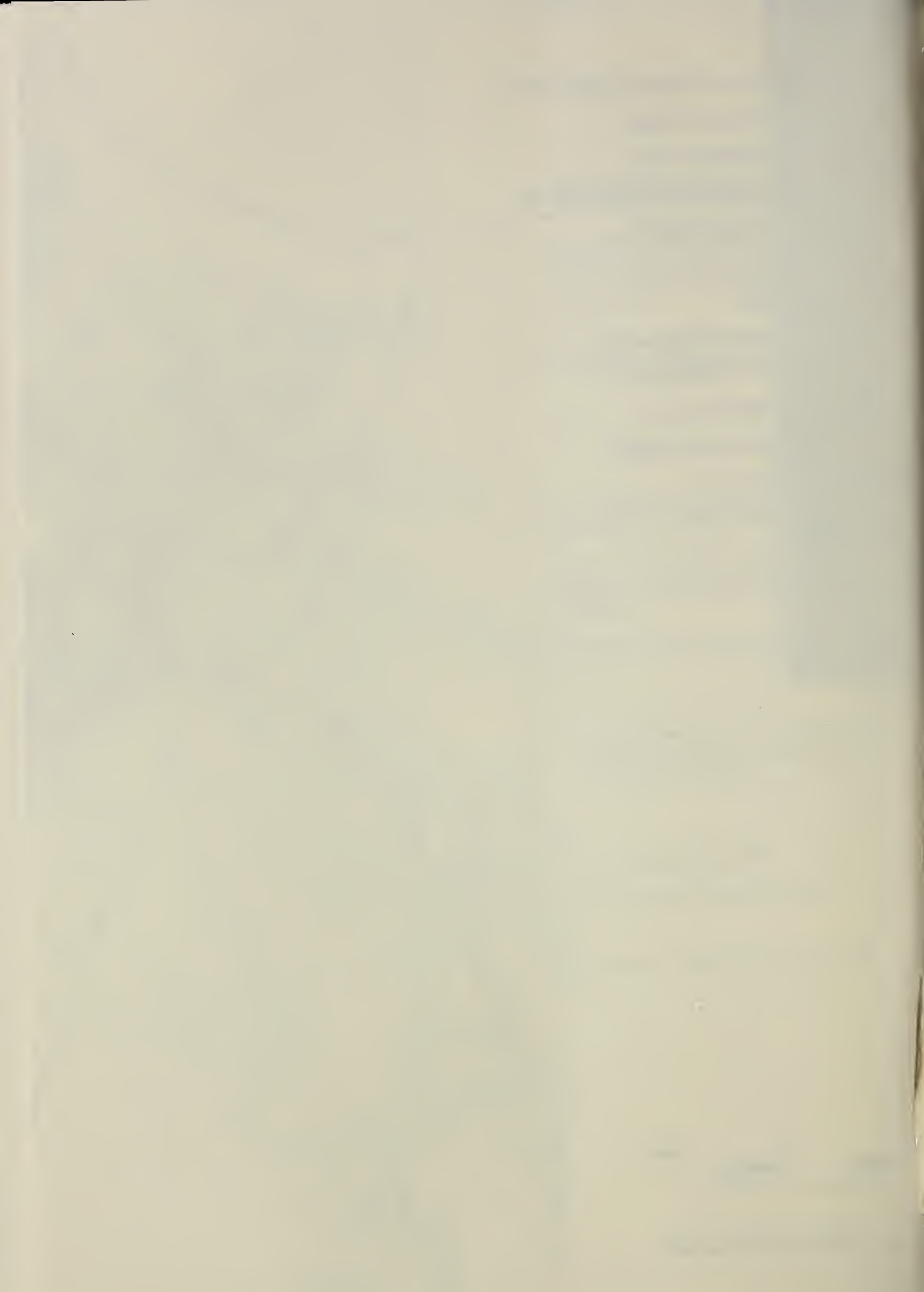
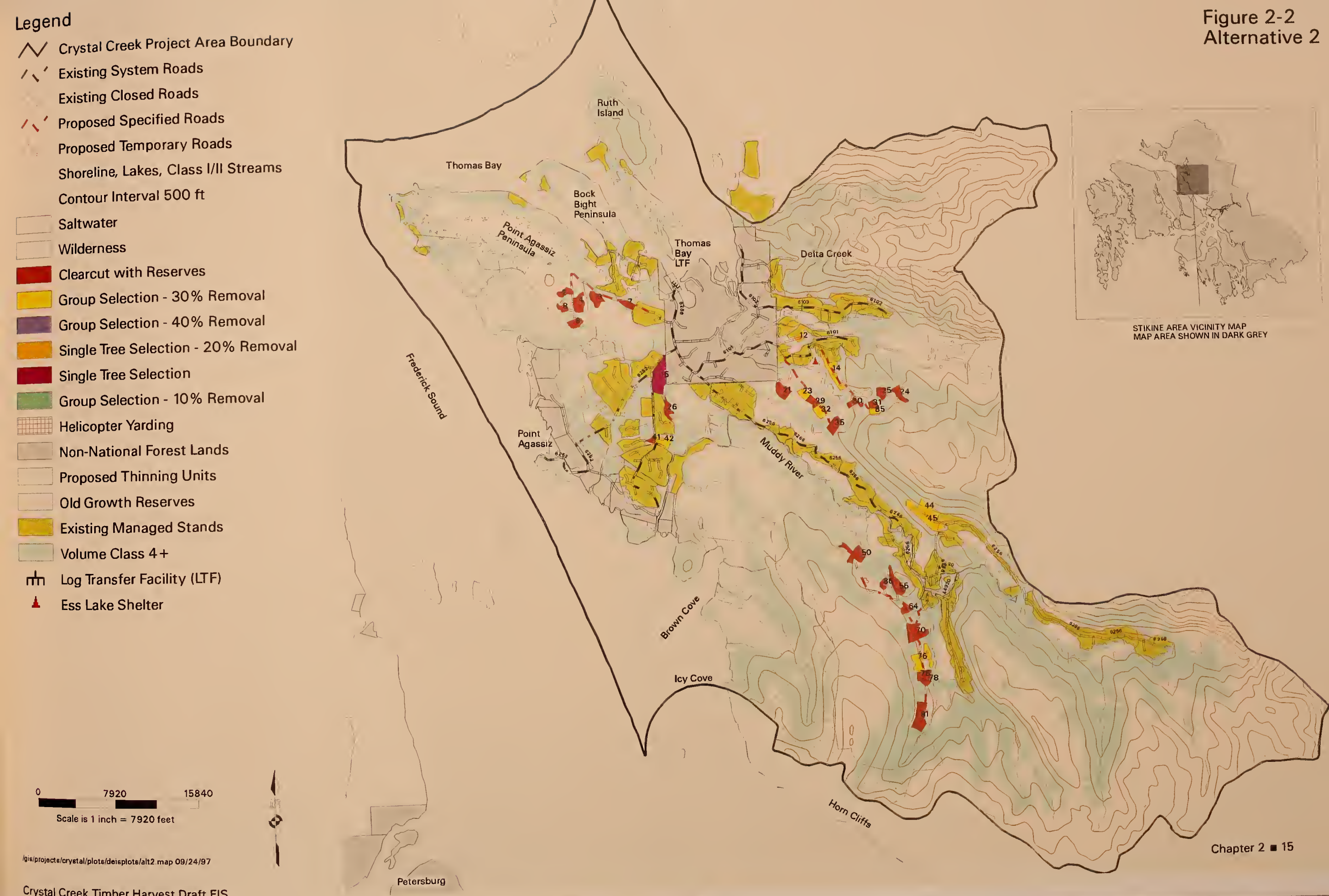




Figure 2-2  
Alternative 2







# Legend























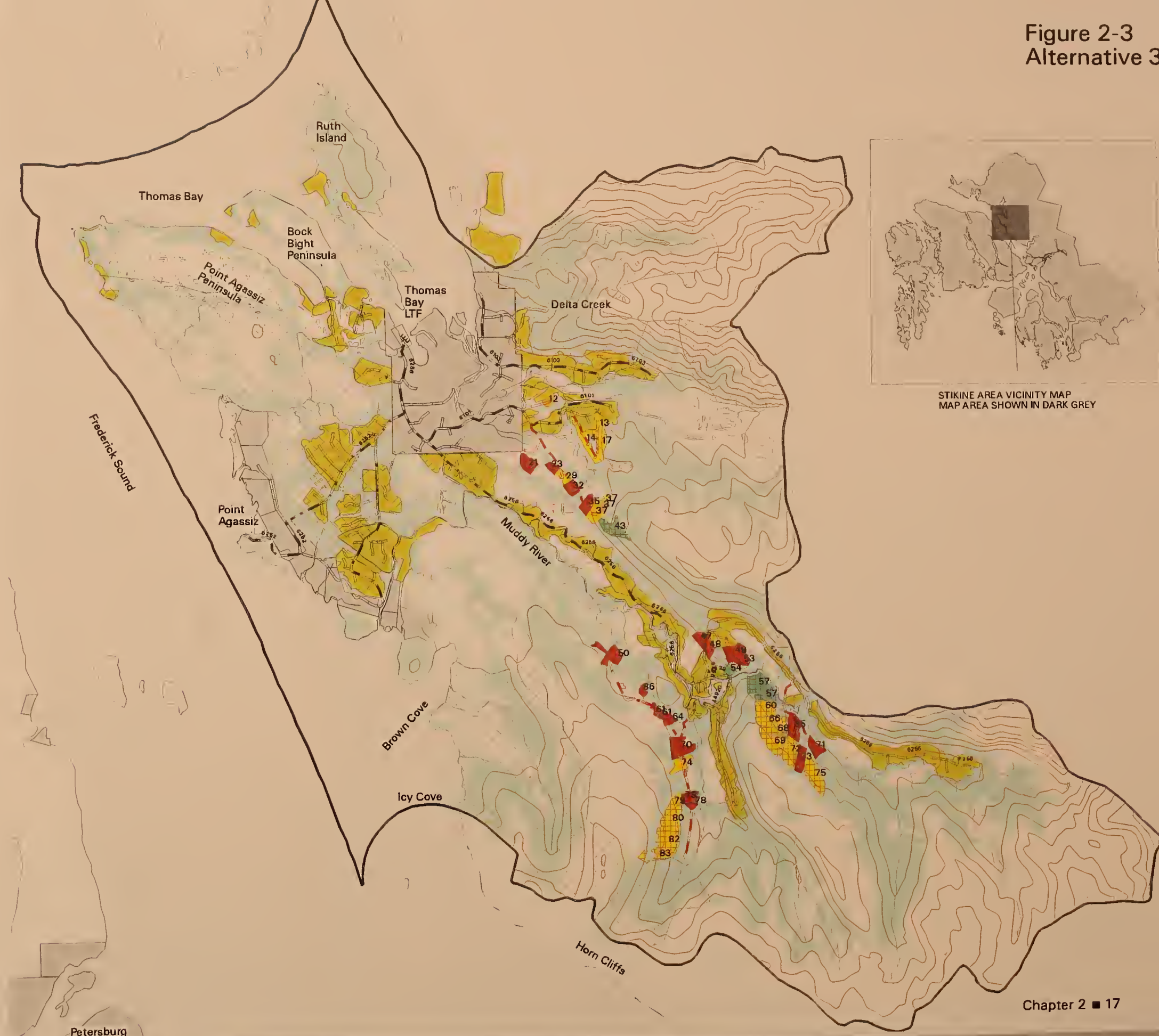
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Existing Closed Roads
-  Proposed Specified Roads
-  Proposed Temporary Roads
-  Shoreline, Lakes, Class I/II Streams
-  Contour Interval 500 ft
-  Saltwater
-  Wilderness
-  Clearcut with Reserves
-  Group Selection - 30% Removal
-  Group Selection - 40% Removal
-  Single Tree Selection - 20% Removal
-  Single Tree Selection
-  Group Selection - 10% Removal
-  Helicopter Yarding
-  Non-National Forest Lands
-  Proposed Thinning Units
-  Old Growth Reserves
-  Existing Managed Stands
-  Volume Class 4+
-  Log Transfer Facility (LTF)

Figure 2-3  
Alternative 3



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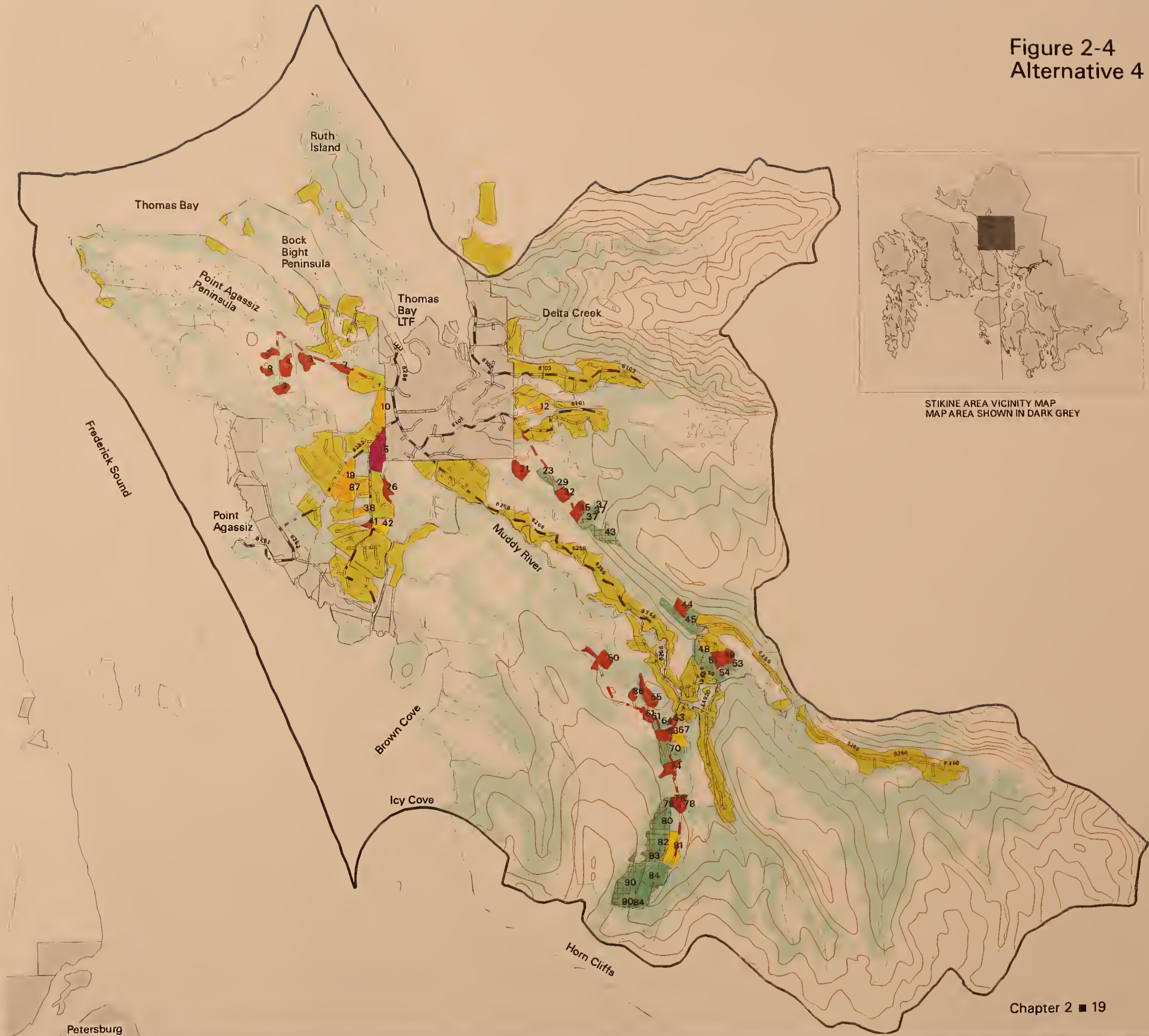
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Figure 2-4  
Alternative 4

- Legend**
- Crystal Creek Project Area Boundary
  - Existing System Roads
  - Existing Closed Roads
  - Proposed Specified Roads
  - Proposed Temporary Roads
  - Shoreline, Lakes, Class I/II Streams
  - Contour Interval 500 ft
  - Saltwater
  - Wilderness
  - Clearcut with Reserves
  - Group Selection - 30% Removal
  - Group Selection - 40% Removal
  - Single Tree Selection - 20% Removal
  - Single Tree Selection
  - Group Selection - 10% Removal
  - Helicopter Yarding
  - Non-National Forest Lands
  - Proposed Thinning Units
  - Old Growth Reserves
  - Existing Managed Stands
  - Volume Class 4+
  - Log Transfer Facility (LTF)


























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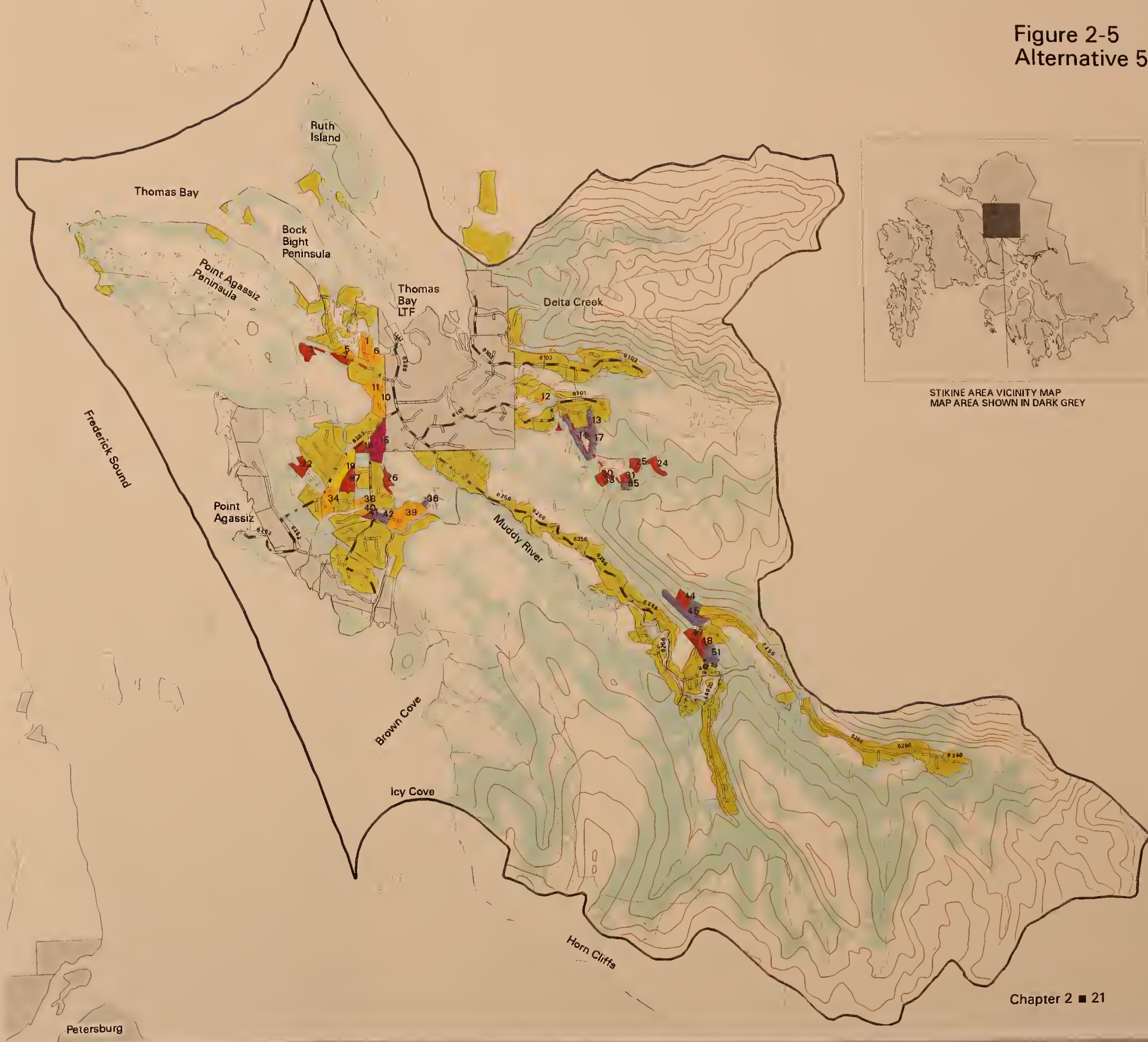
# Legend

-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Existing Closed Roads
-  Proposed Specified Roads
-  Proposed Temporary Roads
-  Shoreline, Lakes, Class I/II Streams
-  Contour Interval 500 ft
-  Saltwater
-  Wilderness
-  Clearcut with Reserves
-  Group Selection - 30% Removal
-  Group Selection - 40% Removal
-  Single Tree Selection - 20% Removal
-  Single Tree Selection
-  Group Selection - 10% Removal
-  Helicopter Yarding
-  Non-National Forest Lands
-  Proposed Thinning Units
-  Old Growth Reserves
-  Existing Managed Stands
-  Volume Class 4+
-  Log Transfer Facility (LTF)
-  Ess Lake Shelter

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Scale is 1 inch = 7920 feet

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Figure 2-5  
Alternative 5





# **Chapter 3**

## **Affected Environment and Environmental Consequences**



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# Chapter 3

## Affected Environment and Environmental Consequences

### Introduction

The Council on Environmental Quality (CEQ) issues guidance to the Federal Agencies to determine the significant issues concerning any proposal and to eliminate those issues which are not significant. With the help of the public and other agencies, we identified issues which were significant enough to be examined in detail given the nature of the proposed action. In this chapter, we describe the environmental effects associated with five significant issues. The significant issues are timber management and economics, moose management, biodiversity, recreation, and transportation. Other concerns raised during public scoping that are not significant issues because they are mitigated in all alternatives or are not significantly affected by any alternative are also discussed. Some other considerations required by policy and law are included at the end of the chapter.

To the maximum extent possible, impacts from the action alternatives were reduced by avoiding harvest in areas where the impacts would be the greatest. Using scoping comments from resource agencies and the public, an interdisciplinary process was used to select the location and extent of harvest units and roads. The application of the Forest Plan, best management practices, and mitigation measures are intended to further limit the extent, severity, and duration of anticipated impacts.



# Issues

## Issue 1- Timber Management and Economics

### Forest Ecology

The most prevalent plant associations are western hemlock/blueberry and western hemlock/blueberry/shield fern with inclusions of yellow-cedar and mountain hemlock. Varying amounts of dwarf mistletoe and fluting are present on the hemlock. Yellow-cedar has some cedar decline which needs to be monitored. Stands are composed of 80% western hemlock with 7% spruce and 13% yellow-cedar and mountain hemlock in some stands. Prevalent site productivity, or site indices, is approximately 75 and 100 based on a Farr's 50 year base (e.g. a tree will theoretically grow 75 feet or 100 feet tall, respectively, in 50 years).

Most stands display old-growth characteristics. There is little evidence of second growth resulting from various types of natural disturbance, such as blowdown. One naturally-occurring second-growth stand on the south side of the Patterson River is attributed to recent glacial retreat. Alluvial flood zones and river terraces along the Patterson have even-aged stands. There are only a few small (less than 5 acres), scattered even-aged stands which appear to have been created by windthrow, suggesting that winds have a relatively small influence on the ecosystem in the Crystal Creek Project Area.

### Windthrow

Harvesting timber stands adjacent to uncut timber stands creates the risk of windthrow along the unharvested edge of these units. Undisturbed timber stands have reached a certain degree of wind stability and keep the main force of the wind above the forest canopy. Once a stand is opened up, the wind is able to exert its full force against the stand edge, making the stand more susceptible to wind throw. Little windthrow has resulted as a consequence of previous harvest, probably because most of the previous harvest has occurred on flat land or in river bottoms. Proposed Units 41 and 42 have had a considerable amount of blowdown. Windthrow may extend up to 200 feet into an uncut stand. Not all the trees are likely to fall; the remaining standing trees will act as a wind buffer for the remainder of the stand. The stand edge can be expected to stabilize after 10 to 20 years. Group selection and other partial cut methods are considered lower risk for blowdown because the size of openings is kept small.

The effects of wind will be considered during the layout of harvest units to mitigate the effect of blowdown in adjacent stands. If practical, units will be located along windfirm boundaries, such as previously harvested units, non-commercial forest, muskegs, and rock outcroppings.

### Dwarf Mistletoe

The occurrence of dwarf mistletoe in mature and over-mature western hemlock stands is widespread in Southeast Alaska. Infection of Sitka spruce and mountain hemlock is rare. Dwarf mistletoe is prevalent at lower elevations of the Crystal Creek Project Area, especially along the coast. The ridges south of Ess Lake contain moderate to heavy mistletoe infections. Dwarf mistletoe reduces the vigor of the trees and often produces a lower quality of timber. Tree growth loss may reach as much as 40% or more. Cankorous swellings often occur at the point of infection on limbs or main stems. These cankers offer an entrance for wood-destroying fungi, which can lead to heart rot.



Dwarf mistletoe responds to light with increased seed production. Rates of spread to adjacent and lower canopy trees may increase in partial cuts where an infected hemlock overstory remains. Spread of the parasite into young-growth stands that regenerate following clearcutting is typically by: 1) infected non-merchantable hemlock trees remaining following the harvest, 2) infected trees on the perimeter of the cutover area and, 3) infected advanced reproduction. Since the residual trees are the primary source to spread dwarf mistletoe, trees with high infections will generally not be left as residual trees, to minimize risk to the new regeneration.

### **Decay Fungi**

Fungi are the major cause of death and decay in the project area. This has led to structurally diverse stands of timber with small-scale canopy gaps. Stand development in these stands is referred to as gap phase development (Oliver and Larson, 1990). Preliminary results indicate that rot development is much slower in southeast Alaska than in areas studied in the Pacific Northwest.

## **Silvicultural Systems**

Even-aged, uneven-aged, and two-aged silvicultural systems are approved for use by the Forest Plan depending on the management objectives of the area. Even-aged management is recommended for producing fast-growing, healthy stands of mixed species. In addition, even-aged management systems may be used to emulate natural catastrophic disturbance or create high-value forage. Two-aged management creates a second-growth stand while retaining old-growth for wildlife benefits. Uneven-aged management is used when the retention of a high canopy cover is desired while still harvesting timber. Where residual green trees need to be retained through a rotation to provide structural diversity and biological legacies, two-aged silvicultural systems are best utilized.

## **Silvicultural Prescriptions**

These diagnostic prescriptions have been developed by a silviculturist during the interdisciplinary process to identify possible silvicultural prescriptions for each proposed harvest unit (see Appendix B - Unit and Road Cards).

### *Clearcutting With Reserve Trees - Two-aged Management*

The main objective is to provide biological and structural diversity in stands by leaving green trees. Unit boundaries will be located with sensitivity to resource concerns and mitigating circumstances including visuals, riparian habitat, soil instability, windthrow probability, and wildlife habitat.

In the Crystal Creek Project Area in the clearcut with reserves units, approximately 85% of the basal area will be removed, creating a two-layered canopy structure with two or more age-classes. Current silvicultural knowledge suggests the biological rotation length will range from 90 years on highly productive sites to 160 years on low productivity sites. Portions of the Ess Lake viewshed may have the rotation extended to about 165 years to meet visual quality standards.

Regeneration following clearcut with reserve harvest will need to be thinned approximately twenty years after harvest. Spacing will be approximately 16 feet between trees, providing room for growth for the remaining trees. Natural openings may provide sites for wildlife browse. Some unthinned areas may be distributed throughout the thinned areas to provide cover for wildlife. The thinning will leave dominant trees which are free of insect and disease infestation, as well as physical

deformities such as breakage, forked tops, and stem fluting. Some stands may require more thinnings and possibly prunings to maintain understory for wildlife browse.

#### *Group Selection - Uneven-aged Management*

Group selection provides a residual tree canopy following harvest which would benefit scenery, wildlife, and soil stability. This system removes trees in groups less than two acres in size and can create a mosaic of irregular openings within the stand. Each opening will regenerate with a uniform age and height; at the end of the rotation, the result will be an uneven-aged stand.

Each group will consist of a mixture of merchantable tree sizes to avoid selecting only the most merchantable trees. Groups of trees infected with dwarf mistletoe will be high priority for harvest.

There were three different group selection prescriptions developed:

- 10% of the basal area will be removed every 20 years (200-year rotation). The groups of trees will usually be less than one acre in size. This will emulate small openings that naturally occur in the Crystal Creek Project Area.
- 30% of the basal area will be removed every 30 to 40 years (90- to 120-year rotation). Groups of trees will usually be 1 to 2 acres in size. Ten percent of the basal area will be retained as reserve trees to more closely emulate old-growth stand characteristics following the final harvest.
- 40% of the basal area will be removed on the first entry with 30% removed on two subsequent entries, spaced about 30 to 40 years apart (90 to 120 year rotation). Groups of trees will usually be one to two acres in size. No reserve trees will be retained at the final harvest. This system was designed to make group selection more economical while maintaining old-growth characteristics for the first two entries.

Helicopter, cable, and shovel yarding systems will be used. On helicopter logged units, there will be more flexibility on the position and the shape of the patches. The patches will be designed to minimize windthrow. On units which are to be cable-logged, the distribution and arrangement of the patches will be limited due to the capabilities of the logging equipment. Cable-logged harvest units will be in narrow strips generally less than 100 feet wide and no more than two acres in size. Leave strips will remain between the harvest strips. Shovel logging is limited to the relatively flat ground. It will provide somewhat more flexibility than cable systems.

As in the clearcutting with reserves prescription, each group of trees will be monitored to ensure adequate restocking of all species to maintain species diversity. Approximately twenty years following harvest, the patches should be considered for potential thinning. Multiple thinnings may be necessary to maintain understory vegetation and develop a multi-storied canopy.

#### *Single-Tree Selection - Uneven-aged management*

Within all units except Unit 15, twenty percent of the basal area would be removed in each entry at 40-year cutting cycles by individually selecting trees. The rotation will be extended beyond the average rotation age (90 to 120 years) to 200 years. Because of the



difficulty of removing individual trees, this prescription can be only used where shovel yarding is possible. This prescription maximizes old-growth structural diversity while harvesting timber.

Due to the relatively small openings created by single-tree selection, regeneration and individual tree growth will be somewhat suppressed. Regeneration will be closely monitored to ensure the cedar component is maintained through the next rotation. Thinning will be unlikely in single-tree selection stands.

Unit 15 is proposed for an experimental single-tree selection. One fourth of the unit will be established as a control. The other part will be divided into three sections and harvested at 20%, 40%, and 60% removal of the basal area respectively. The primary objective is to study the effects of varying intensities of single tree harvest on moose and deer winter use of the stand. This is an expansion of the administrative study in another area where 20% and 40% of the basal area of old-growth stands had been removed to study ungulate use. Subsequent entries will be contingent upon the results of the administrative study, e.g. if 40% removal appears to be the optimal habitat, future management strategies for the sub-units with 20% and 60% removal will be modified to emulate the 40% strategy. Shovel-yarders will be used in this harvest.

**Table 3-1.**  
**Acres Harvested by Silvicultural Prescription**

Silvicultural Prescription	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Clearcut with Reserve Trees	0	618	532	599	338
Group Selection 40% Removal	0	0	0	0	118
Group Selection 30% Removal	0	94	206	35	19
Group Selection 10% Removal	0	0	15	86	0
Single Tree Selection 20% Removal	0	3	3	37	63
Single Tree Selection Unit 15	0	25	0	25	25
<b>Total Harvested Acres*</b>	<b>0</b>	<b>740</b>	<b>756</b>	<b>782</b>	<b>563</b>

\*Note: Harvested acres include acres from clearcut with reserve trees and the percentages harvested from the group selection acres.



## Tentatively Suitable Forest Land

Nearly all the National Forest land in the Crystal Creek Project Area is forested land (Table 3-2). Forested land has at least 10% tree cover or formerly had at least 10% tree cover and is not developed for non-forest use. Of this forested land, 60% of the area is considered productive forest. Productive forest land is capable of producing 20 cubic feet per acre per year of industrial wood or has a site index of 40. (Site index measures the relative capability of an area to grow wood. It is based on the height of dominant trees at a given age.)

Tentatively suitable forest as defined by the Forest Plan includes productive forest that is physically suitable for timber harvest, can be adequately restocked in five years, and has been identified in the Forest Plan as suitable for timber management. Land on slopes greater than 72%, identified forested wetland soils, areas within riparian, beach, and estuary buffers are examples of areas that are not suitable forest land. The LUDs within the project area where timber harvest is suitable are: Timber Production, Modified Landscape, and Scenic Viewshed.

---

**Table 3-2.**  
**Land Classification Acres**

<b>Fresh Water</b>	<b>Non-Forested Land</b>	<b>Non-Productive Forest</b>	<b>Productive Forest</b>	<b>Tentatively Suitable Forest</b>
1,003 acres	10,348 acres	19,910 acres	29,521 acres	14,112 acres

---

## Volume Strata

Three volume strata are now recognized in the Tongass National Forest with the Forest Plan (Figure 3-3). These are:

*High Volume Strata* - Areas within timber inventory volume classes 5, 6, and 7 on non-hydric soils and on hydric soils (wetland soils) on slopes greater than 55 percent.

*Medium Volume Strata* - Areas within timber inventory volume classes 5, 6, and 7 on hydric soils with slopes less than or equal to 55 percent; areas within timber inventory volume class 4 that are either on non-hydric soils, or are on hydric soils on slopes greater than 55 percent.

*Low Volume Strata* - Areas within timber inventory volume class 4 on hydric soils with slopes less than or equal to 55 percent.

---

**Table 3-3.**

**Volume Strata in the Crystal Creek Project Area - Volume per acre is from the Forest Plan and Does Not Include Volume Class 3.**

Strata	Average MBF/Acre	Average Cubic Feet/Acre	Productive Forest Acres	Tentatively Suitable Acres*
Low	16.9	4.7	3,540	1,138
Medium	24.1	6.1	6,716	3,296
High	29.3	6.9	13,946	9,540
Total Acres			24,202	9,854

\* Includes isolated or difficult to access land.

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**Table 3-4.**

**Harvested Acres by Volume Strata**

Volume Strata	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Low	185	35	165	30
Medium	174	151	168	106
High	384	570	449	427
Total Acres	740	756	782	563

---

## Volume Classes

Volume classes were replaced with volume strata during the revision of the Forest Plan. The discussion of volume classes is included here because there have been comments during scoping for the protection of volume classes 6 and 7 (Table 3-5). Most of the volume class 6 and 7 stands occur in the river bottoms of the Patterson and Muddy Rivers. A large percentage of these stands has already been harvested, approximately 3,717 acres on National Forest Land.

**Table 3-5.****Volume Class Composition in the Crystal Creek Analysis Area**

Volume Class	Board Feet Per Acre	Productive Forest	Tentatively Suitable Forest*
3	<8,000	4,796	3,993
4	8-20,000	9,174	4,169
5	20-30,000	11,917	4,352
6 and 7	30,000 +	2,679	1,828

\* Includes isolated or difficult access acres.

Source: Stikine Area Database (Updated by Crystal IDT). The volume classes were determined by comparing the existing TIMTYP and TIMCLU GIS layers. The Integrated Resource Inventory plot data (6/8/96) plus on-site visits by other members of the IDT were used to update the GIS layers. Some stand data collected in the Brown Cove area during the late 1980's was also used (see Figure 3-2).

The amount of each volume class harvested by alternative is in accordance with the objectives of that alternative (Table 3-6). Alternative 2 tried to harvest a higher percentage on lower volume sites to create openings for moose forage production without affecting moose winter range. Alternative 3 avoids harvest in volume class 6 and 7 (except for Unit 12, an experimental single-tree selection). Alternative 4 mimics small natural disturbance openings. Alternative 5 concentrates the harvest in higher volume stands that are already accessible by roads in order to minimize road building.












**Table 3-6.****Total Harvested Acres by Volume Class**

Volume Class	MBF/Acre	Alt. 2	Alt. 3	Alt. 4	Alt. 5
4	8,000-20,000	306	148	326	73
5	20,000-30,000	315	570	340	211
6 and 7	30,000+	71	13	116	240
Other*		48	25	40	39

\*Non-Forest or Low-Productive Forest



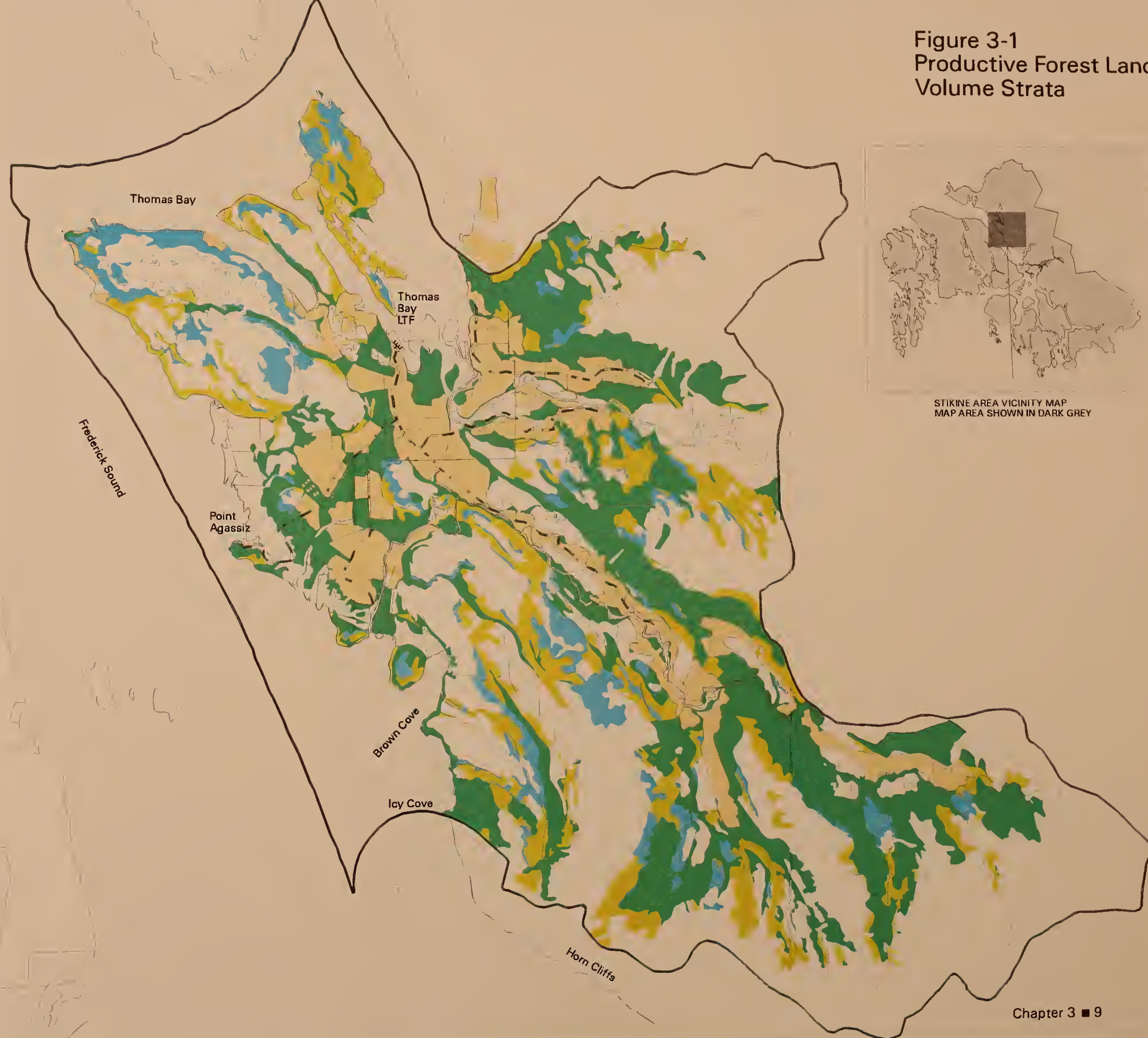
# Legend

-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  High Volume Strata
-  Medium Volume Strata
-  Low Volume Strata
-  Existing Managed Stands
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

**Figure 3-1**  
Productive Forest Land  
Volume Strata



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY



0 7920 15840  
Scale is 1 inch = 7920 feet



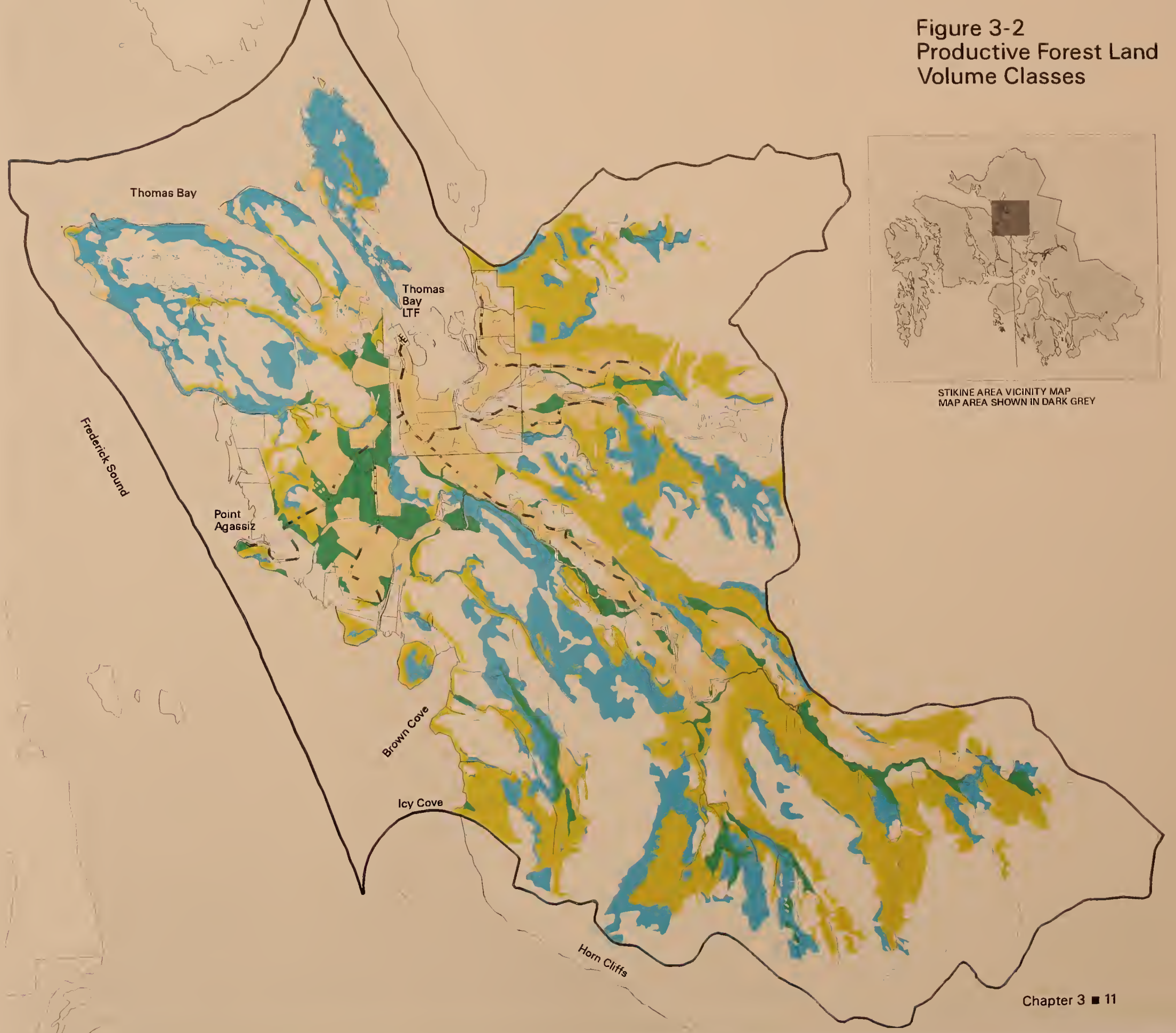




Legend

- Crystal Creek Project Area Boundary
- Existing System Roads
- Shoreline, Lakes, Class I/II Streams
- Volume Class 6 and 7
- Volume Class 5
- Volume Class 4
- Volume Class 3
- Saltwater
- Wilderness
- Non-National Forest Lands
- Log Transfer Facility (LTF)

Figure 3-2  
Productive Forest Land  
Volume Classes



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY

0 7920 15840  
Scale is 1 inch = 7920 feet

projects/crystal/plots/deisplots/tentvolc.map 09/24/97





## **Irreversible and Irretrievable Commitment of Resources**

The development of roads to access the timber would result in loss of productive forest land. Although this would not be an irreversible impact, the volume loss during the time that the roads are in place could not be replaced. Temporary roads take land out of timber production for approximately 10 years. Permanent roads would affect timber production on those sites indefinitely.

## **Second Growth Management**

Currently about 28% of the tentatively suitable forested land is second-growth timber. This project, if implemented, would add between 2% and 3% to second-growth management. Natural regeneration often results in overstocked stands with more than 300 seedlings per acre which requires thinning to stimulate the growth of fewer, higher quality trees. Other objectives of thinning may include control of species composition of the stand, increasing windfirmness, and increasing wildlife forage.

An intensive thinning program began in 1976. Initially, the spacing between residual trees was established at eight feet. This was progressively changed to ten feet, twelve feet, and 16 feet spacing, which is the current standard. Sixteen-foot spacing provides a longer time-frame for understory development and tree growth. Stands were thinned at approximately 12 to 15 years. A total of 3,458 acres have been precommercially thinned.

All units that are clearcut with reserves will be examined for thinning at approximately 15 years old. Priority for treatment will be given to those stands that have the highest potential for tree growth or achieve other resource objectives such as thinning for wildlife.

Thinning may be delayed as long as: 1) there is still some understory which will grow and be available for forage and 2) crop trees do not exceed approximately seven inches diameter at breast height (dbh). When trees exceed approximately seven inches when thinned, the thinning slash may impede movement of deer and moose until it deteriorates.

To maintain the understory vegetation when the trees are larger than seven inches in diameter, pruning may be a viable alternative. Pruning may be done on highly productive sites to increase value of the trees (clear stems, no knots/tight knots) and to increase indirect sunlight, consequently increasing the herbaceous layer in the understory for wildlife. The extent of the release of the understory is unknown at this time. Pruning may extend the survival of the browse until the trees can be removed commercially. Pruning has been done on 131 acres of the managed stands in the project area.

Currently, commercial thinning may be done on stands at 50 to 70 years of age to utilize inevitable mortality, increase the growth of the remaining timber, and maintain understory browse for wildlife.

## **Economics**

### **Timber Demand**

The market demand for Tongass timber is derived from complex factors including Southeast Alaska's timber industry capacity, international timber markets, and available and projected supplies locally, nationally, and world-wide. The 1997 Forest Plan analysis has estimated that the timber market will be substantially lower than previous estimates. This is due to the closure of both pulpmills in Southeast Alaska. These mill closures have significantly affected the pulp wood demand, but have not similarly affected the sawlog demand. Based on the Forest Plan, the median estimate of demand

for the entire Tongass timber program for the next decade (1998-2007) is an average of 110 MMBF of sawtimber volume per year. This demand reflects the recent changes in world timber and wood products markets.

## Timber Supply

The available supply of timber from the Tongass National Forest is based on the Allowable Sale Quantity (ASQ). The ASQ is based on the amount of wood growing on lands determined tentatively suitable by the Forest Plan. Growth rate, quality of wood, and species composition is also factored in when estimating the timber supply. Table 3-7 is a summary of the ASQ for the next decade for the Tongass National Forest and the Stikine Area.

With the closure of the last Southeast Alaska mill that processed utility wood, there is a question of what to do with the low-grade logs, since regulations do not allow export at this time. Currently the policy is being considered by the Forest Service in the treatment of utility grade wood is making the purchaser remove it and apply for an export permit for a market outside Southeast Alaska.

**Table 3-7.**  
**Allowable Sale Quantity**

	ASQ sawlog plus utility (MMBF)	ASQ sawlog plus utility (MMCF)	ASQ sawlog only (MMBF)	ASQ sawlog only (MMCF)
Tongass NF	267	65	219	54
Stikine Area	95	23	78	19

## Forest Service Costs

All the costs listed below are from the Timber Sale Program Information Reporting System (TSPIRS) reports Fiscal Year 1992 and Fiscal Year 1996.

### Sale Preparation

Unit layout and cruising costs rise significantly when silvicultural prescriptions require marking of cut and leave trees. The Regional average for sale preparation costs rose from \$18.25/mbf to \$52.00/mbf from 1992 to 1996. This rise was in part due to the use of silviculture methods other than clearcutting. The Alternatives-to-Clearcutting Research Study required up to eight times more person-days to do an individual tree marked unit versus a clearcut unit, according to the layout forester (Parks, personal communication).

Accessibility to the units is a major cost factor. Helicopter access (compared to road access) and steep terrain increases sale preparation costs.

Using these criteria, Alternative 5 will be the least costly to prepare in spite of the individual tree marking involved. Alternative 4 will be the most expensive to prepare because of inaccessible units and the difficulty of marking and cruising small, very scattered groups (less than one acre) over the entire unit. Alternative 2 will be the second least costly to prepare; the Ess Lake area can be reached by road and the units up the Crystal Creek drainage are mostly clearcut with reserves. Alternative 3 will not be as costly as Alternative 4 since the group selection groups will be larger (up to two acres) and more concentrated.



## Sale Administration

Sale administration costs are higher when helicopter logging is involved because of the difficulty of checking the timber harvest for compliance. The more scattered and smaller group openings make it harder to ensure that all the groups are cut. For this reason, the sale administration costs will be higher for Alternatives 3 and 4 and lower for Alternatives 2 and 3. Costs for sale administration have more than doubled in the past four years.

## Logging Operability

One factor that affects the economic analysis is the difficulty and expense of logging the timber. The cost of logging is influenced by the silvicultural method chosen, the logging system used, and the amount of road needed to access the timber. Table 3-8 shows the amount of volume harvest by silvicultural method. Following are tables that display the acres and volumes by logging operability (Tables 3-8 to 3-10). Shovel logging is used where the land is relatively flat and adjacent to a road. Helicopter logging is used where road building is difficult. Helicopter units are generally within one mile of a road. All timber in the action alternatives is classed as Non-Interchangeable Component I (NIC I). NIC I refers to all timber on lands of normal operability. This includes tractor logging, standard cable logging, such as highlead, slackline, and running skyline, and standard helicopter yarding (distances up to three quarters of a mile).

**Table 3-8.**  
**Volume Harvested by Silvicultural Method (MBF)**

Silvicultural Prescription	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Clearcut with Reserve Trees	0	12,138	11,939	11,455	7,467
Group Selection 40% Removal	0	0	0	0	3,197
Group Selection 30% Removal	0	2,411	5,610	899	409
Group Selection 10% Removal	0	0	421	2,367	0
Single Tree Selection 20% Removal	0	125	125	1,105	1,860
Single Tree Selection*	0	696	0	696	696
Total MBF	0	15,370	18,094	16,523	13,896

\*Unit 15 - This unit that will be divided into four parts with 0%, 20%, 40%, and 60% removal using single-tree selection.

**Table 3-9.**  
**Harvested Acres by Logging System\***

Logging System	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Shovel Logging	255	14	426	602
Standard Cable	535	564	471	261
Standard Helicopter	0	188	36	0
Total Treated Acres	790	766	933	863

\*Clearcut with Reserve Trees and Single-Tree Selection assumes that the entire unit will need to be accessed. Group Selection only includes the acres of the groups harvested.

**Table 3 - 10.**  
**Volume Harvested by Logging System (MBF)**

Logging System	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Shovel Logging	3,404	125	4,626	7,530
Standard Cable	11,966	12,911	10,909	6,366
Standard Helicopter	0	5,058	988	0
Total Net MBF	15,370	18,094	16,523	13,896

## Economic Comparison of Alternatives

Alternative 1 - This alternative would not harvest any timber or have any road construction or reconstruction. Alternative 1 would show a negative net value since no timber would be harvested and the analysis costs have been incurred.

All action alternatives showed a negative appraised net value using the Region 10 residual value appraisal system. Alternative 5 had a significantly less negative value than the other three action alternatives due to the low amount of road construction. Although the net stumpage value is a negative value, the sales will be advertised at base rates. Depending on the market, the sales may be sold at a much higher value. Recent sales have sold for ten to fifty times the advertised value.

Alternative 2 - This alternative has the highest road costs, because it builds the most roads and includes a bridge crossing of the Muddy River. It contains the most acres to be harvested using the clearcut with reserve tree prescription (approximately 15% of the trees left). Most of these units are within the lower volume stands in order to maximize forage production and minimize the loss of higher volume stands for winter range. The higher volume stands to be harvested would be group selection with a 30% removal of the trees. These units are designed for cable logging or shovel logging.



Alternative 3 - Two bridge crossings of the Muddy River are planned for this alternative with slightly less road being built than in Alternative 2. About one-third of the volume is planned for helicopter logging, mostly with a 30% group selection removal of the stand volume. The rest of the logging, except for 14 acres, will be cable yarded. None of the high-volume stands in the Thomas Bay/Point Agassiz are planned for harvest. This alternative harvests the most volume (about 18 MMBF).

Alternative 4 - This alternative has the second least road costs of the alternatives with one bridge crossing of the Muddy River. Many of the units will have a group selection prescription that will remove only 10% of the stand volume in groups less than one acre, either by cable logging or helicopter logging. Only 36 acres (< 1 MMBF) will be helicopter logged. Some units will have single-tree selection (20% removal of the stand volume) using shovel logging in the high-volume stands near the existing Thomas Bay road system. Some group selection with a 30% removal will also occur. Most of the clearcuts with reserve trees will occur in lower volume stands.

Alternative 5 - There will be no Muddy River crossing with this alternative; the least amount of roads will be built of the action alternatives. The most prevalent yarding system will be shovel logging using single-tree selection in the high volume stands off the existing road system. The rest of units in this area will be clearcut with reserve trees. New roads will be built to access east of Ess Lake; group selection removing 40% of the stand volume will be cable logged. This alternative harvests the least amount of volume (about 14 MMBF).

## **Opportunities for Offering Small Sales**

The Forest Supervisor has the responsibility to decide which alternative or combination of alternatives to implement. Deciding how many sales and what sale size will be offered on a yearly basis is an administrative decision made after the Record of Decision is signed. This will be dependent on the current market and the demand for timber by various operators. To facilitate the development of competitive markets, the Forest Service and the Small Business Administration agreed on an annual set-aside goal of approximately 100 MMBF for the Tongass National Forest.

A small sale is considered to be approximately one million board-feet or less with little or no roading. Unit 12, containing approximately 125,000 board feet that would be shovel logged and is accessible from the existing road, is a possibility in all alternatives. Alternative 5, which uses the existing road system on the Point Agassiz Peninsula, would provide the greatest opportunity for small operators with a possible 7.5 MMBF on 714 acres that could be harvested with shovel logging. Alternatives 2 and 4 could provide 1.9 MMBF (131 acres) for small operators within Units 7, 12, 15, 26, and 41. Small sale opportunities may increase after a larger sale is sold and more access road is provided. An example of this situation would be to delay harvest on units along a road system to be built in conjunction with a larger sale.



## Issue 2 - Moose Management

Moose were chosen as a project-level management indicator species to evaluate the effects of proposed alternatives because they are an important subsistence species within the project area, are sensitive to the loss of understory shrub and forb forage in young forest stands (e.g., clearcuts), and prefer a habitat mosaic of young and old forests. Moose has been a species of concern within the project area since the early 1970's. Extensive clearcut logging in the Patterson and Muddy River drainages from 1956-1976 provided road access for hunters and created open clearcuts which attracted moose.

In 1978, the Forest Service, in cooperation with the Alaska Department of Fish and Game, initiated a radio telemetry study of moose in the Thomas Bay area. This study was designed to learn more about their habitat needs and to develop a habitat management plan that would attempt to promote and sustain the moose population over time. The telemetry studies (Doerr 1983) suggested that moose preferred the glacial riverwash shrub stands along the Patterson River that contained high quantities of willows and cottonwoods. Clearcuts under 30 years of age were used more extensively than unlogged forests. Sitka spruce river-terrace stands were preferred to western hemlock-spruce old growth, and forests on more productive sites were preferred to forests growing on less productive soils. Muskegs, estuaries, and ponds received little use.

Habitat use patterns were seasonal. Clearcuts were utilized most heavily in the spring, fall, and during winter months with low snowfall. During deep snow conditions (60 or more inches of snow in open areas), riparian shrub stands and high-volume coniferous stands were preferred and clearcuts were avoided.

Doerr (1984) suggested that, with precommercial thinning at a 12' by 12' spacing or wider, moose would use clearcuts as foraging areas at Thomas Bay to at least stand age 35. Subsequent observations at Thomas Bay support this assumption.

There has been little research done on moose use of even-aged second growth. However, loss of understory and low deer use has been documented for 25-year-old to 150-year-old unthinned second growth (Alaback 1982, Wallimo and Schoen 1980).

A habitat suitability model (Doerr 1997a) was developed for moose within the project area using telemetered relocations, following the general method used for other species. Doerr (1984) also suggested a qualitative model for moose habitat management. Moose populations apparently increase in response to increased browse production in young forest stages. Severe winters are responsible for periodic die-offs of moose. Therefore, both clearcuts with high forage production and forested winter range are important habitat components that should be sustained throughout the timber harvest rotation. Long-range habitat conditions for moose would depend on scheduling harvests over the entire rotation, determining the age of the rotation based on land use designation, establishing a desired ratio of high forage regrowth to forested winter range (Doerr 1984, suggested a 50:50 ratio), and identifying and protecting key winter range. Silvicultural practices that increase forage, such as multiple thinnings or shortened rotations, would presumably benefit moose.

Because Thomas Bay moose appear to be nonmigratory with home ranges averaging 17 square miles (Doerr 1983), the high-forage and winter-range areas should be dispersed. The project area has been divided into four areas suitable for silvicultural management for moose (Figure 3-3), the Patterson, West Muddy, East Muddy, and Upper Muddy Moose Habitat Management Areas. A fifth area for potential moose habitat management is the State land surrounding the mouth of the Patterson River.

The large acreage of clearcuts created from 1956-76 is believed to be an important factor in the build-up of the herd and the current high population density of moose within the project area. A critical period for habitat management of moose in this area is approaching. Existing clearcuts are developing closed canopies and understory forage is being shaded out. Without further silvicultural treatments, a noticeable decline in the moose population is expected to occur by year 2010 as 4000 to 5000 acres of formerly high-value moose foraging habitat are lost. A rapid loss of forage is beginning in the West Muddy, Patterson, and East Muddy Moose Habitat Management Areas and on State land. Forage loss is not expected to be significant in the Upper Muddy Moose Habitat Management Area until sometime after Year 2005 because logging did not occur until the 1970's, and the clearcuts have been precommercially thinned.

One way to maintain high forage in existing clearcuts is to thin before understory is lost at stand age of about 30 to 40 years. To date, approximately 440 acres of clearcuts at Thomas Bay have been thinned and about 273 additional acres are scheduled for thinning and pruning within the next year. Observations of clearcuts that have been thinned or thinned and pruned reveal increased growth of understory forage species in response to the treatments and suggest that these treatments can maintain understory production and moose use of the clearcut for an additional 20 years or so (to stand age 50 or 60 years). However, if the thinning is done after most of the trees reach about seven inches or more in diameter, slash may impede deer and moose movement in the stand for some time. Commercial thinning, which would remove the larger trees for commercial use, should be effective at improving moose and deer use of these stands.

The Crystal Creek Project Area is the most important moose hunting area for residents of Petersburg who account for about 93% of the total harvest. The remaining seven percent of the harvest was taken by residents of other Southeast Alaska communities, Anchorage, Fairbanks, Ninilchik, and outside of Alaska (Table 3-11).

The average yearly harvest from 1987-1996 was 19 bulls. Table 3-11 shows the Thomas Bay moose harvest by community. Only bulls with spikes, forked antlers, three or more brow tines, or antlers 50 inches or more in width are currently legal. Special regulations also govern the use of motorized vehicles for moose hunting. The antler restrictions, along with the vehicle restrictions, are believed to be sufficient to prevent overhunting of the Thomas Bay moose herd. Several hundred people hunt for moose each year within the project area. Old logging roads are used for access to hunting areas and to transport moose out of the field. Several hunters expressed concern that additional roads and trails would negatively affect moose hunting by increasing competition. The areas of most concern were along the upper Patterson River and around Brown Cove Lake which are accessible by float plane. Other people expressed the concern that roads need to be maintained for access. The Alaska Department of Fish and Game strategic plan for managing moose at Thomas Bay from 1990-1994 states that roads are important for access and help distribute the hunting pressure. The Alaska Department of Fish and Game plan further urges the Forest Service to maintain and restore roads and bridges to improve access for both consumptive and non-consumptive users. Currently, the Alaska Department of Fish and Game is contracting the clearing of roads on State Land near the head of Thomas Bay in order to improve access for hunters.



**Table 3-11.**  
**Thomas Bay Area Moose Harvest by Community from 1987-1996\***

Community	Average Harvest (1987-96)	% Total Harvest
Subsistence Community**		
Petersburg	17.8	93
Edna Bay	0.2	1
Sitka	0.2	1
Coffman Cove	0.1	0.5
Wrangell	0.1	0.5
Non-Subsistence Community	0.6	3
Alaska		
Non-resident	0.1	0.5
Total	19.1 (9-26)#	100

\*Source is unpublished Alaska Department of Fish and Game harvest data (Crain 1996)

\*\*Communities listed as subsistence have been determined to have a subsistence priority for moose within the project area by the Federal Subsistence Board. Currently there is no open Federal Subsistence season, but there is an open sport moose season under State regulation.

#Range of annual harvests is in the parenthesis.

## Environmental Impacts

Both a qualitative and a quantitative model were used to display the effects of the alternatives on moose habitat. The qualitative model followed Doerr (1984) and envisions a schedule of timber harvest, silvicultural treatment of second growth stands, and maintenance of winter range that will optimize an equal acreage of high forage regrowth and winter habitat at the end of the timber harvest rotation and thereafter in perpetuity. The model assumes that a mosaic of forested winter range and young stands created by clearcutting or group selection is compatible, or even beneficial, to moose habitat requirements. The model is useful in determining the acres of moose winter range and high forage regrowth needed at the end of the rotation, the amount of forest that should be logged each decade to provide for forage production for moose, and the amount of second growth that needs to be treated to maintain forage production in each Moose Habitat Management Area.

### *Maintaining a Habitat Mosaic for Moose*

For the purposes of maintaining a habitat mosaic for moose, it was necessary to determine the average age of rotation in each moose management area and to determine the average percent of the rotation that a harvested stand will provide high understory forage production. In the qualitative model, we assumed that the normal timber harvest rotation was 110 years and that the Ess Lake area would require a 165-year rotation for visual reasons. We assumed that half of the second growth stands would be thinned and/or pruned for prolonged forage production. Table 3-12 shows the average harvest rotation, acres of winter range needed at the end of the rotation, amount of forest to be



harvested per decade to the end of the rotation, average rotational age, and estimated acreage of existing regrowth that will require treatment by year 2010 to maintain forage production for moose.

One of the outputs of the qualitative model was the identification of the amount of winter moose habitat needed to maintain an equal ratio of winter range to high forage regrowth at the end of the rotation within each moose habitat management area (Table 3-12). We compared this requirement with the amount of winter range protected from timber harvest by old-growth reserves, riparian and beach buffers, and other considerations (Table 3-13). Three of the moose habitat management areas, East Muddy, Patterson, and Upper Muddy, have enough winter habitat protected in areas not available for timber harvest that additional designations for winter habitat management are not required for moose. Both the qualitative and quantitative moose models assume that moose habitat is enhanced by maintaining river terrace forest as winter habitat. The qualitative moose model suggests that an additional 170 acres of high-volume forests should be designated as moose winter habitat in the West Muddy Moose Habitat Management Area.

The qualitative moose model estimated how much forest could be harvested to maintain high forage regrowth habitat for moose (Table 3-12). Stands created by clearcutting or group selection are expected to provide forage for at least 30 years, longer if thinned periodically. We compared the 20-year harvest rate suggested by the model to the acreage of openings created by clearcutting and group selection in each moose habitat management area in each alternative (Table 3-14). A ranking of the alternatives by how well they provide a long-term mosaic of winter range to high-forage regrowth for moose is as follows: Alternative 2 and 4 (best), Alternative 5, Alternative 3, and Alternative 1 (worst). Alternative 2 was chiefly designed to implement the qualitative moose model and provides a harvest schedule that is compatible with maintaining an equal ratio of high forage regrowth to winter range at the end of the harvest rotation in all four moose habitat management areas. Alternative 2 provides about 74% of the estimated timber harvest openings needed during the next 20 years to maintain a habitat mosaic for moose. Alternative 4 is also compatible with the moose model and provides about 72% of the estimated timber harvest openings needed during the next 20 years. Alternative 5 provides little additional high forage regrowth in the East Muddy Moose Habitat Management Area. Alternative 3 provides no new high forage regrowth habitat in the West Muddy Moose Habitat Management Area and overharvests the Upper Muddy Moose Habitat Management Area. Alternative 1 does not use timber harvest to promote forage for moose in any of the Moose Habitat Management Areas.

Existing second growth stands that may need silvicultural treatment during the next 10-15 years to maintain forage production have been identified in all alternatives. Some stands may be treated as part of this project or other silvicultural projects. Prolonging the understory in existing second growth is a crucial part of the qualitative moose model which estimates that about 1720 acres of second growth treatment are needed by about year 2010 in order to maintain the desired balance of high forage regrowth areas.

**Table 3-12.****Amount of Harvest and Thinning Needed to Maintain a Balance Between Forage and Winter Range by Rotation and Moose Habitat Management Area**

<b>Moose Habitat Management Area<sup>#</sup></b>	<b>Average Age of Rotation in Years</b>	<b>Acres of Winter Range Needed*</b>	<b>Acres of Timber Harvest Per Decade**</b>	<b>Acres of Second Growth Needing Thinning by 2010</b>
West Muddy	115	920	120	200
Patterson	130	650	90	470
East Muddy	115	1,480	220	650
Upper Muddy	115	570	80#	400#

◆ Refer to Figure 3-3 for the location of the moose management areas.

\* River-terrace forests, old-growth forests within the 1000' beach buffer, and inland old-growth forests, including forests that have been logged using single tree selection, that have at least 20,000 board feet/acre are assumed to provide for winter range for moose. The acreages shown only include areas under 1500' elevation since a moose habitat model has not been developed for areas above 1500' elevation.

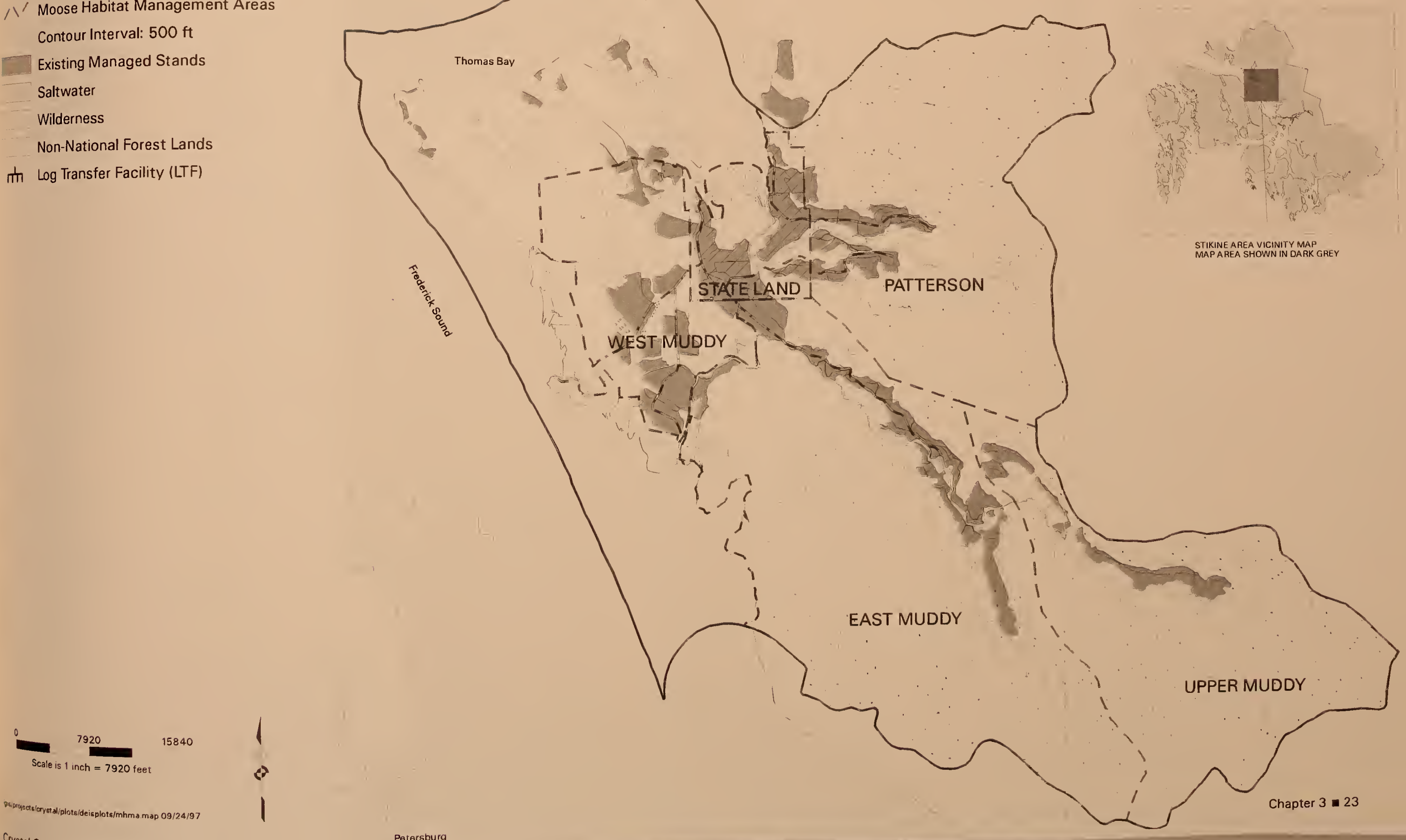
\*\* Acres refer to the amount under 1500' elevation that can be harvested by clearcutting and group selection each decade from now until the end of the rotation.

# The qualitative model for moose indicates that no new timber harvest should occur in the Upper Muddy Moose Habitat Management Area until the existing clearcuts begin to lose understory. This is expected to occur sometime after 2005. After 2005, about 80 acres timber harvest per decade plus about 400 acres of existing second growth treatment will be needed to maintain a balance of high forage regrowth areas for moose in the Upper Muddy Moose Habitat Management Area.

Legend

- Crystal Creek Project Area Boundary
- Existing System Roads
- Shoreline, Lakes, Class I/II Streams
- Moose Habitat Management Areas
- Contour Interval: 500 ft
- Existing Managed Stands
- Saltwater
- Wilderness
- Non-National Forest Lands
- Log Transfer Facility (LTF)

Figure 3-3  
Moose Habitat Management Areas







**Table 3-13. Moose Winter Range Habitat Needs**

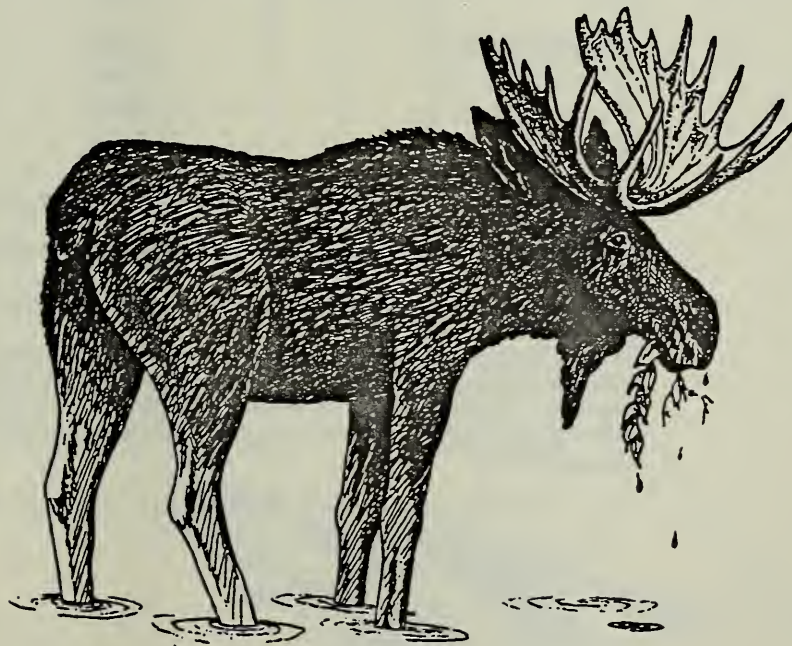
<b>Moose Habitat Management Area ♦</b>	<b>Acres of Winter Range Needed*</b>	<b>Acres of Winter Range Not Available for Timber Harvest **</b>	<b>Additional Acres of Winter Range Needed for Moose</b>
West Muddy	920	750	170
Patterson	650	730	50✱
East Muddy	1,480	2,120	0
Upper Muddy	570	710	0

♦ Refer to Figure 3-3 for the location of the moose habitat management areas.

\* River-terrace forests, old-growth forests within the 1000' beach buffer, and inland old-growth forests, including forests that have been logged using single tree selection, that have at least 20,000 board feet/acre are assumed to provide for winter range for moose. Only forests under 1500' elevation provide winter habitat for moose during deep snow conditions.

\*\* Forests above 1500' elevation and on oversteepened slopes are not included in these calculations.

✱About 50 acres on an inactive river terrace in the Patterson Moose Management Habitat Area have been identified for management as winter habitat even though these acres are not needed to meet winter range requirements. The qualitative moose model suggests that all forests on river terrace soils should be managed as winter range for moose.



**Table 3-14.**

**Comparisons Between the Moose Model 20-year Harvest Rate and the Acres Harvested by Alternative**

<b>Moose Management Area #</b>	<b>Alternative</b>	<b>Acres of Harvest Suggested by Model 1995-2015*</b>	<b>Acres of Harvest Scheduled by Alternative*</b>
West Muddy	1	230	0
	2	230	175
	3	230	0
	4	230	175
	5	230	210
Patterson	1	180	0
	2	180	191
	3	180	170
	4	180	108
	5	180	131
East Muddy	1	440	0
	2	440	300
	3	440	287
	4	440	303
	5	440	61
Upper Muddy	1	80#	0
	2	80#	35
	3	80#	244
	4	80#	85
	5	80#	64

\* Refer to Figure 3-3 for the location of the moose management habitat areas.

\*Refers to acres of openings created by clearcutting and group selection on forest under 1500' elevation.

#The qualitative model for moose indicates that no new timber harvest should occur in the Upper Muddy Moose Habitat Management Area until the existing clearcuts begin to lose understory. This is expected to occur sometime after 2005. After 2005, about 80 acres timber harvest per decade plus about 400 acres of existing second growth treatment will be needed to maintain a balance of high forage regrowth areas for moose in the Upper Muddy Moose Management Area.



# Legend















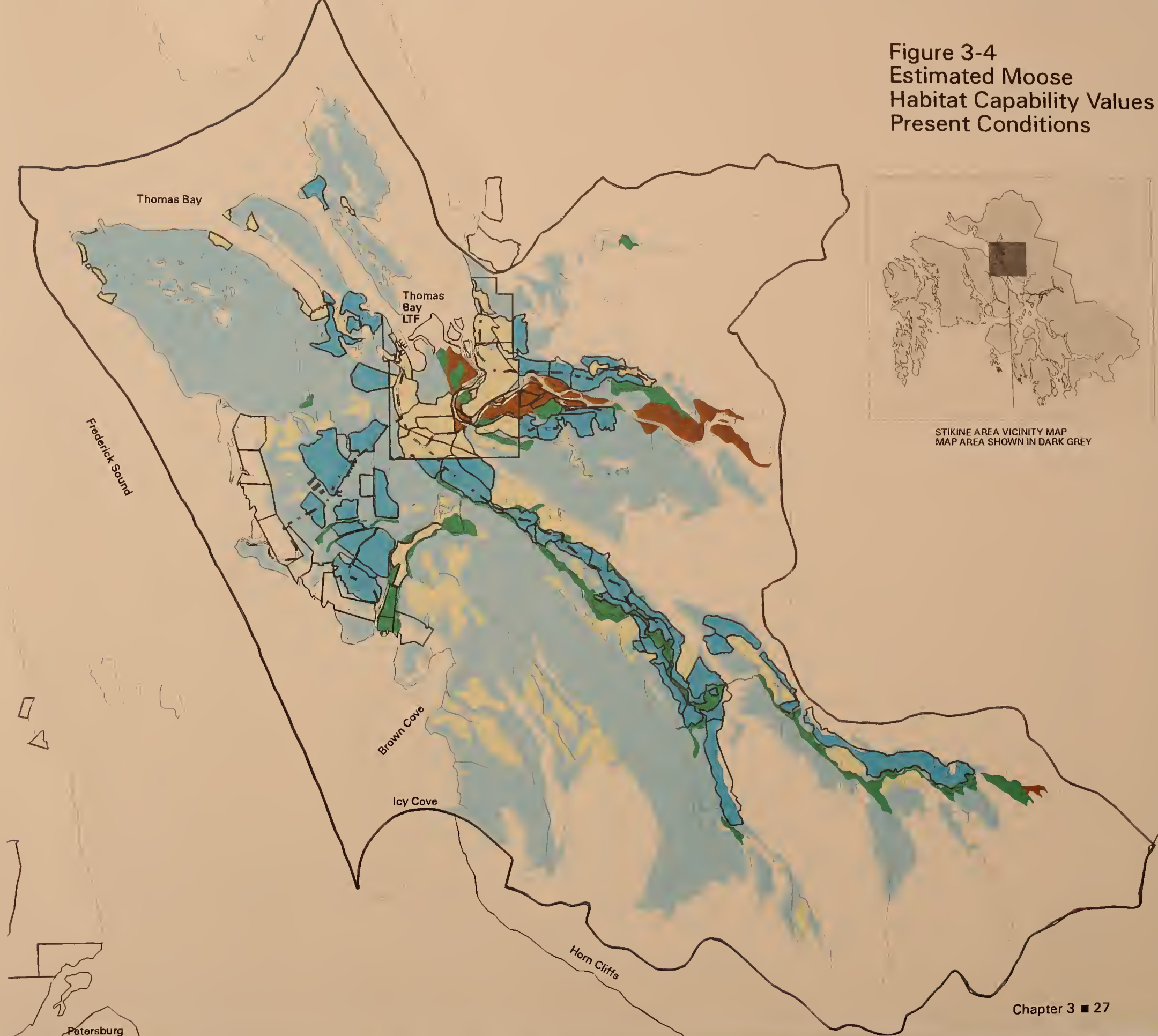
-  Existing Managed Stands
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  0.9 to 1.0 (Best Moose Habitat)
-  0.6 to 0.89
-  0.3 to 0.59
-  0.1 to 0.29
-  0.01 to 0.09 (Poor Moose Habitat)
-  0 (No Value)
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

Figure 3-4  
Estimated Moose  
Habitat Capability Values  
Present Conditions



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY



0 7920 15840  
Scale is 1 inch = 7920 feet





### *Changes in Moose Habitat Capability*

A quantitative habitat suitability model (Doerr 1997a) was used to estimate the amount of change in moose carrying capacity as a result of each alternative. Moose carrying capacity is expressed compared to the estimated 1954 capacity (Table 3-15). This model suggests that moose habitat capability was increased by 18% within the project area as a result of the logging that occurred from 1955-1976. Since 1980, the model suggests that the habitat quality has declined by 10% to 108% of its prelogging value. This is the result of clearcuts closing in and losing understory. The model suggests that moose habitat would have been 13% lower today if about 3,400 acres of second growth had not been thinned from 1976-1996. Even with the second growth treatment and logging proposed in all action alternatives, the moose habitat potential is expected to decline by about 6 to 8 percent by 2010. Alternative 1 with thinning would result in a ten percent decline in habitat quality by 2010.

The quantitative model estimates that, without further logging and thinning, moose habitat capability will decline to 86% of the 1954 prelogging value by year 2010 and to 79% by year 2020. The logging proposed in Alternatives 2, 3 and 4 is estimated to increase moose habitat by 4%. The logging proposed in Alternative 5 would increase moose habitat by only 3%. If the second growth treatment needs identified in the qualitative moose model (Table 3-12) can be accomplished, moose habitat capability would be increased by 11% compared to no further treatment.

Changes in moose habitat quality beyond year 2010 will depend on whether or not further logging and second growth management are continued. The qualitative moose model sustains a habitat mosaic at the end of the harvest rotation comprised of 28% forested winter range (26% in Patterson Moose Habitat Management Area due to the extended rotation for visuals), 28% logged openings with high forage production, and 44% advance second growth with low understory on commercial forest lands suitable for moose management and logging (e.g., forests under 1500' elevation, oversteepened soils excluded, river terrace forests maintained as winter habitat). This habitat mosaic is estimated to be capable of sustaining up to 31% more moose over the entire rotation than an entirely unlogged forest. The 26% forested winter range scenario for the Patterson Moose Habitat Management Area is estimated to produce 21% more moose than an unlogged forest landscape. The feasibility of implementing such a mosaic will depend on scheduling logging in each moose management area over the entire rotation and treating second growth stands to extend forage production.



Table 3-15.

Estimated Changes in Moose Habitat Capability Within the Crystal Creek Project Area as a Result of Past Logging and Thinning and Possible Future Logging and Thinning.

Alternative	1954	1980	1997	% of Estimated 1954 Moose Habitat Capability					
				Project	Cumulative	Project	Cumulative	Project	Cumulative
1 w/out thinning*	100	118	108 (95)#	0	86	0	86	0	79
w/thinning**				+11	97	+11	90	0	79
2 w/out thinning*	100	118	108 (95)#	+4	90	+3	82	-2	77
w/thinning**				+15	101	+14	93	-2	77
3 w/out thinning*	100	118	108 (95)#	+4	90	+3	82	-1	78
w/thinning**				+15	101	+14	93	-1	78
4 w/out thinning*	100	118	108 (95)#	+4	90	+3	82	-2	77
w/thinning**				+15	101	+14	93	-2	77
5 w/out thinning*	100	118	108 (95)#	+3	89	+2	81	-1	78
w/thinning**				+14	100	+13	92	-1	78

\*Assuming no treatment of existing second growth to enhance understory forage for moose.

\*\*Assuming 1,720 acres of second growth is treated to prolong forage production of an additional 20 years as indicated in the qualitative moose model.

#In parenthesis is shown the estimated current carrying capacity for moose if the Forest Service had not precommercially thinned approximately 3,400 acres of clearcuts from 1976-1996 within the Crystal Creek Project Area.

### *Single-tree Selection Harvest*

Commercial thinning of older second growth (50 years and older) would benefit moose beyond the effects shown in the moose models, if such logging is feasible in the future. Selective logging proposed in the action alternatives may have some benefits for moose if the logging substantially increases understory forage. At the present time, it is difficult to quantify what these effects would be.

The implementation of single-tree selection, rather than clearcutting, to maintain or improve moose habitat would reduce impacts to old-growth associated species while providing opportunities for timber harvest. All action alternatives propose at least one unit (Units 12 and 15) that will provide the opportunity to further study the response of moose to single-tree selection harvest methods.

### *Changes in Moose Harvests*

Under all alternatives, there may be a decline in the moose population and moose harvests during the next 10 to 15 years as second growth stands continue to lose understory (Table 3-16). The degree of the decline in moose habitat quality will be affected by the amount of future timber harvest and the amount of second growth that can be treated to maintain understory. Alternative 1 (no proposed timber harvest) without future thinning is expected to result in a 20% decline in the moose habitat capability within the project area between now and Year 2010. Alternatives 2, 3, and 4 with about 1,720 acres of thinning would result in only a 7% decline by 2010.

Alternative 5 and the action alternatives without thinning would have declines between 7% and 20% (Table 3-16).

**Table 3-16.**

**Estimated Changes In Moose Habitat Capability and Moose Harvests Between 1997 and 2010 By Alternative With and Without Thinning\*.**

Alternative	% Estimated 1954 Moose Habitat Potential		Estimated Annual Moose Harvest**	Estimated Change in Annual Moose Harvest
	1997	2010	2010	2010
<b>1</b>				
w/out thinning	108	86	15 (-20%)	-4 moose
with thinning*	108	97	17 (-10%)	-2 moose
<b>2</b>				
w/out thinning	108	90	16 (-17%)	-3 moose
with thinning*	108	101	18 (-7%)	-1 moose
<b>3</b>				
w/out thinning	108	90	16 (-17%)	-3 moose
with thinning*	108	101	18 (-7%)	-1 moose
<b>4</b>				
w/out thinning	108	90	16 (-17%)	-3 moose
with thinning*	108	101	18 (-7%)	-1 moose
<b>5</b>				
w/out thinning	108	89	16 (-18%)	-3 moose
with thinning*	108	101	18 (-8%)	-1 moose

\* Thinning assumes that about 1,720 acres of existing second growth are treated by Year 2010 to maintain forage for moose.

\*\* Estimated percent change in moose harvests from the present are given in parenthesis. A yearly average of 19 moose were taken from 1987-96 and it is assumed that moose harvests by 2010 will decline at the same rate as predicted moose habitat capability.

Annual moose harvests are estimated to decline by about 1 to 4 moose per year by 2010 (Table 3-16). While both proposed timber harvest and treatment of existing second growth should temporarily improve moose habitat, treatment of existing second growth has the greatest potential over the next 10-15 years and accounts for about 75% of the predicted increase in moose habitat quality.



Moose habitat quality within the project area beyond 2010 will depend on the amount of timber harvest and treatment of second growth. Careful scheduling of future logging and thinning has the potential to permanently sustain a huntable moose populations. Of the action alternatives, Alternatives 2 and 4, have the best mixture of high forage regrowth and forested winter range that will be permanently sustained throughout the project area.

## Issue 3 - Biodiversity

The analysis of this issue focused on these aspects of biodiversity:

- 1) the maintenance of old-growth forest habitat, including the protection of the highest-volume timber stands;
  - 2) the effect of timber harvest on old-growth associated wildlife species; and
  - 3) the effect of timber harvesting on subsistence activities within the project area.
- The effects of the alternatives on Threatened, Endangered, and Sensitive Species are addressed in Other Environmental Considerations.

## Maintenance of Old-growth Habitat

### *Establishment of Small Old-growth Reserves*

Three small Old-growth Habitat Reserve (OGR) blocks have been identified as part of the Tongass Land and Resource Management Plan to assure the viability of old-growth associated species within the Crystal Creek Project Area (Figure 3-5). The IDT made some boundary modifications to these reserves to match existing land ownership boundaries and recognizable forest stand and land features (Figure 3-6). The effect of the modifications was a slight increase in both the acreage of old-growth habitat and the total acres within the designated reserves (Table 3-17).

The proposed modifications to Delta Creek included dropping a managed stand and adding forest on a steep slope. Part of the Special Interest Area was included in this acreage. An isolated patch (33 acres), near the Patterson Glacier within the Modified Landscape LUD was included. Some acreage within managed stands was deleted from the Point Agassiz OGR and some forested beach fringe was added. Acreage within the Brown Cove OGR was moved from the west side of Crystal Creek to the east side to exchange lower volume, more accessible timber for higher volume, less accessible timber within the modified landscape LUD. These changes are expected to be a non-significant amendment to the Forest Plan.

In addition, the U. S. Fish and Wildlife Service suggested changes to two reserves (Figure 3-7). One of their suggestions would more than double the size of the Point Agassiz reserve. This recommended change would protect most of the remaining highest volume forest in the Point Agassiz area. Over half of the original highest volume forest in the project area has been previously harvested. The U. S. Fish and Wildlife Service felt that this low elevation highest volume forest was an essential habitat feature that needed permanent protection as old-growth habitat to maintain biodiversity. This recommendation paralleled comments received from the Alaska Department of Fish and Game. This change would remove approximately 1,300 acres from the Scenic Viewshed LUD which designates suitable timber available for harvest. This may or may not be a significant Forest Plan amendment, if it establishes a protocol for modification of small OGRs.

The U.S. Fish and Wildlife Service recommended two minor changes to the Brown Cove OGR. These changes were to delete the small knoll on the northwest side of Brown Cove that was not connected to the rest of the forested stands in the reserve and to add a forested stand on the west side at the head of Crystal Creek. The area in the upper Crystal Creek drainage was added to maintain a travel corridor along Crystal Creek for



goats, wolves and other wildlife species. These changes added about 75 acres of Old-Growth Habitat to the Brown Cove Reserve from the Modified Landscape LUD.

Using the small OGR criteria in Appendix K, of the Forest Plan, the Delta Creek Small OGR as mapped in the Forest Plan, did not meet the criteria that required 16% of the VCU be in a small reserve. Therefore, about 1,258 acres, including 463 acres of productive old growth, was added to the Delta Creek reserve to meet the Forest Plan criteria. Some of these acres were in a non-development LUD (Special Interest Area); other acres were on steep slopes with the Scenic Viewshed LUD.

**Table 3-17.**  
**Volume Class Composition of Small Old-Growth Reserves**

Old-Growth Reserve	Productive Old-growth Acres	Total*
Delta Creek:		
Forest Plan	1,672	2,794
IDT Modification	2,324	3,202
FWS Recommendation	2,324	3,202
Point Agassiz: VCU 489		
Forest Plan	1,200	2,353
IDT Modification	1,278	2,546
FWS Recommendation**	2,518	5,594
Brown Cove: VCU 489		
Forest Plan	2,567	4,652
IDT Modification	2,667	4,756
FWS Recommendation	2,742	4,843

\*Total refers to the total acres within the old growth reserve including non-old growth acres.

\*\*Some acres are within VCU 487.

Alternative 1 presents the Old Growth Reserves as developed by the Forest Plan. Alternatives 2, 4, and 5 present old-growth reserves as modified by the Crystal IDT. Alternative 3 presents Old Growth Reserves as recommended by the U. S. Fish and Wildlife Service. Their suggestions made slight modifications to the Brown Cove Reserve and more than doubled the size of the Point Agassiz Reserve.

Features common to all alternatives include three small Old Growth Reserves within the project area, 1000-foot beach and estuarine buffers, the protection of the remaining old growth habitat on Ruth Island, and riparian buffers. All alternatives meet the minimum Forest Plan old-growth reserve criteria of at least 16% the VCU in small reserves for VCU 489 (Table 3-18). Alternatives 2 through 5 meet this criteria in VCU 487, but Alternative 1, the Forest Plan design, does not. Old Growth Reserves in Alternatives 1, 2, 4, and 5 all contain at least the minimum Forest Plan standards of 50% productive old-growth forest.

In Alternative 3, the Delta Creek and the Brown Cove Old Growth Reserves contain at least the minimum of 50% productive old growth. The Point Agassiz old growth reserve contains 45% productive old growth because the old growth reserve includes harvested stands along with the remaining high-volume old growth in the Point Agassiz. The Point Agassiz old growth habitat reserve contains modifications recommended by the U. S. Fish and Wildlife Service. Their concern is maintaining the remaining high volume old-growth habitat in the Point Agassiz area. This remaining high volume old growth is very fragmented so it does not meet the Forest Plan criteria for an old-growth habitat reserves even though it contains more acres of old growth than other reserves (Table 3-18).

**Table 3-18.**

**Percent of Value Comparison Units (VCU) and Old Growth Composition of Old-Growth Reserves**

Forest Plan Criteria	Alt. 1		Meet or Exceed the Criteria			
			Alts. 2, 4, 5		Alt. 3	
16% of VCU in Small Reserves						
VCU 487 ④	No	12.3%*	Yes	18.0%*	Yes	16.5%*
VCU 489 ④	Yes	16.6%*	Yes	17.3%*	Yes	22.6%*
Minimum 50% Productive Old Growth Within the Reserves:						
Delta Creek	Yes	60%**	Yes	66%**	Yes	66%**
Point Agassiz	Yes	51%**	Yes	50%**	No	45%**
Brown Cove	Yes	55%**	Yes	56%**	Yes	57%**

④ A portion of the Point Agassiz Reserve overlaps into VCU 487 in Alternative 3 and is included in the VCU 487 acres.

\* Percent of VCU within the reserve. Total VCU acres include state and private land.

\*\* Percent of reserve with old-growth forests with at least 8,000 board feet/acre.

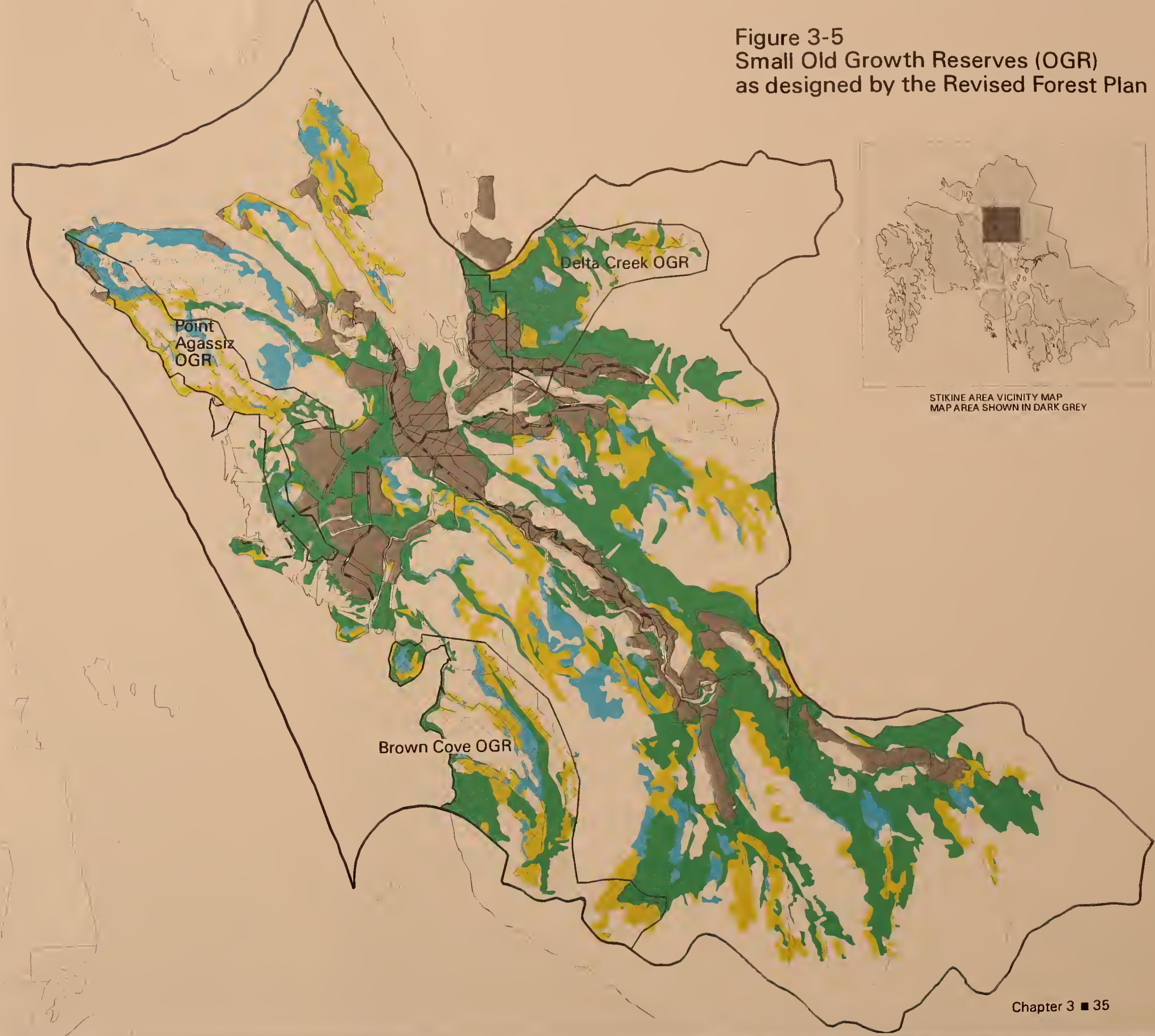
The amount of productive old growth that will remain after each proposed alternative is shown in Table 3-19. Currently there are about 22,280 acres of productive old growth on National Forest lands or about 82% of what occurred in 1954 prior to the start of large-scale logging within the project area. Alternative 1 would not harvest any additional old growth. The action alternatives would remove from 1.7 to 2.8% of the 1954 old growth total using clearcut with reserves and group selection harvest methods. The use of group-selection harvest methods would retain old forest stands with small openings of two acres or less.



Legend

- Crystal Creek Project Area Boundary
- Existing System Roads
- Shoreline, Lakes, Class I/II Streams
- High Volume Strata
- Medium Volume Strata
- Low Volume Strata
- Existing Managed Stands
- Saltwater
- Wilderness
- Non-National Forest Lands
- Old Growth Reserves
- Log Transfer Facility (LTF)

Figure 3-5  
Small Old Growth Reserves (OGR)  
as designed by the Revised Forest Plan



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY

0 7920 15840  
Scale is 1 inch = 7920 feet

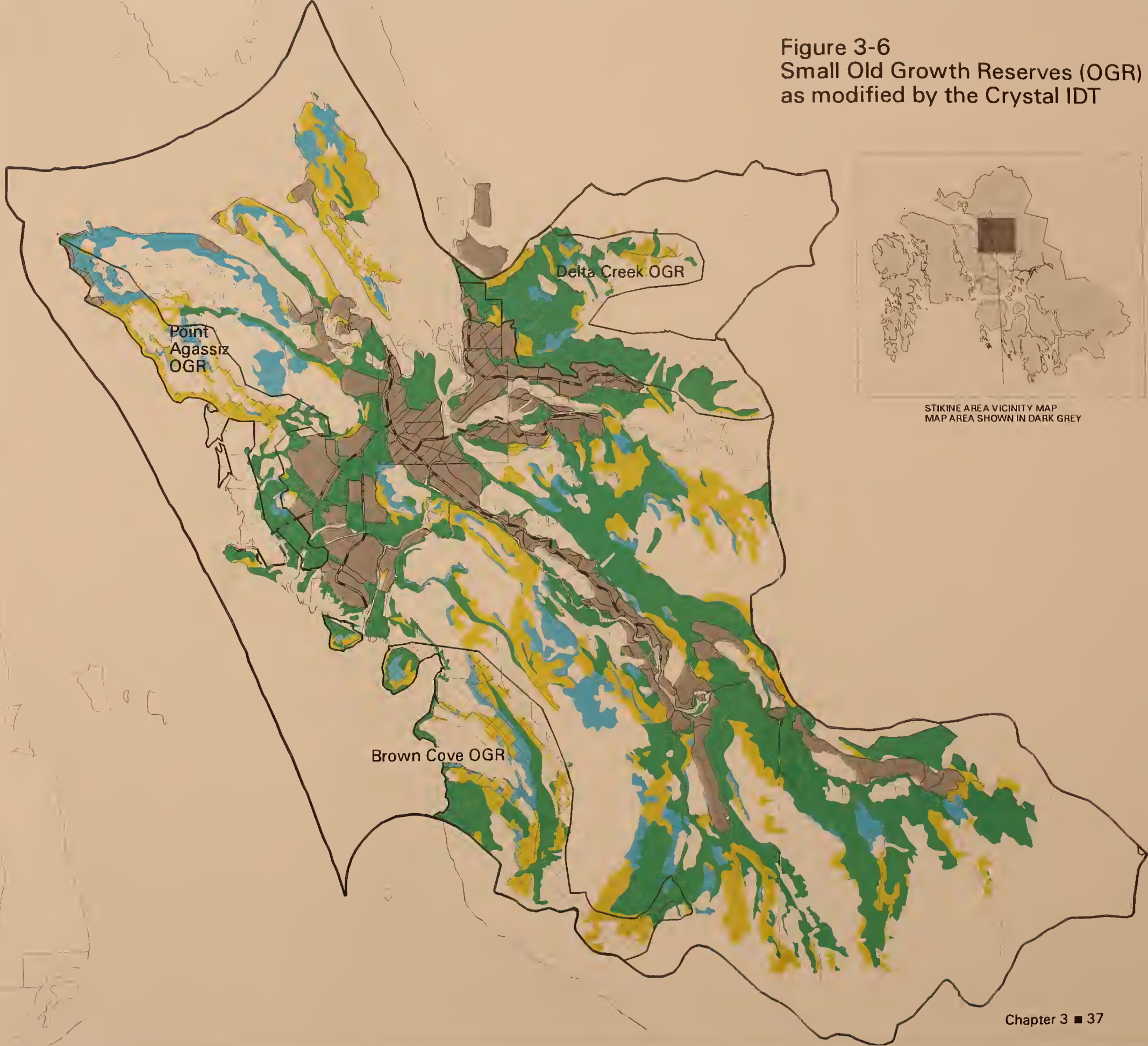






- Legend**
- Crystal Creek Project Area Boundary
  - Existing System Roads
  - Shoreline, Lakes, Class I/II Streams
  - High Volume Strata
  - Medium Volume Strata
  - Low Volume Strata
  - Existing Managed Stands
  - Saltwater
  - Wilderness
  - Non-National Forest Lands
  - Old Growth Reserves
  - Log Transfer Facility (LTF)

Figure 3-6  
Small Old Growth Reserves (OGR)  
as modified by the Crystal IDT



0 7920 15840  
Scale is 1 inch = 7920 feet







# Legend













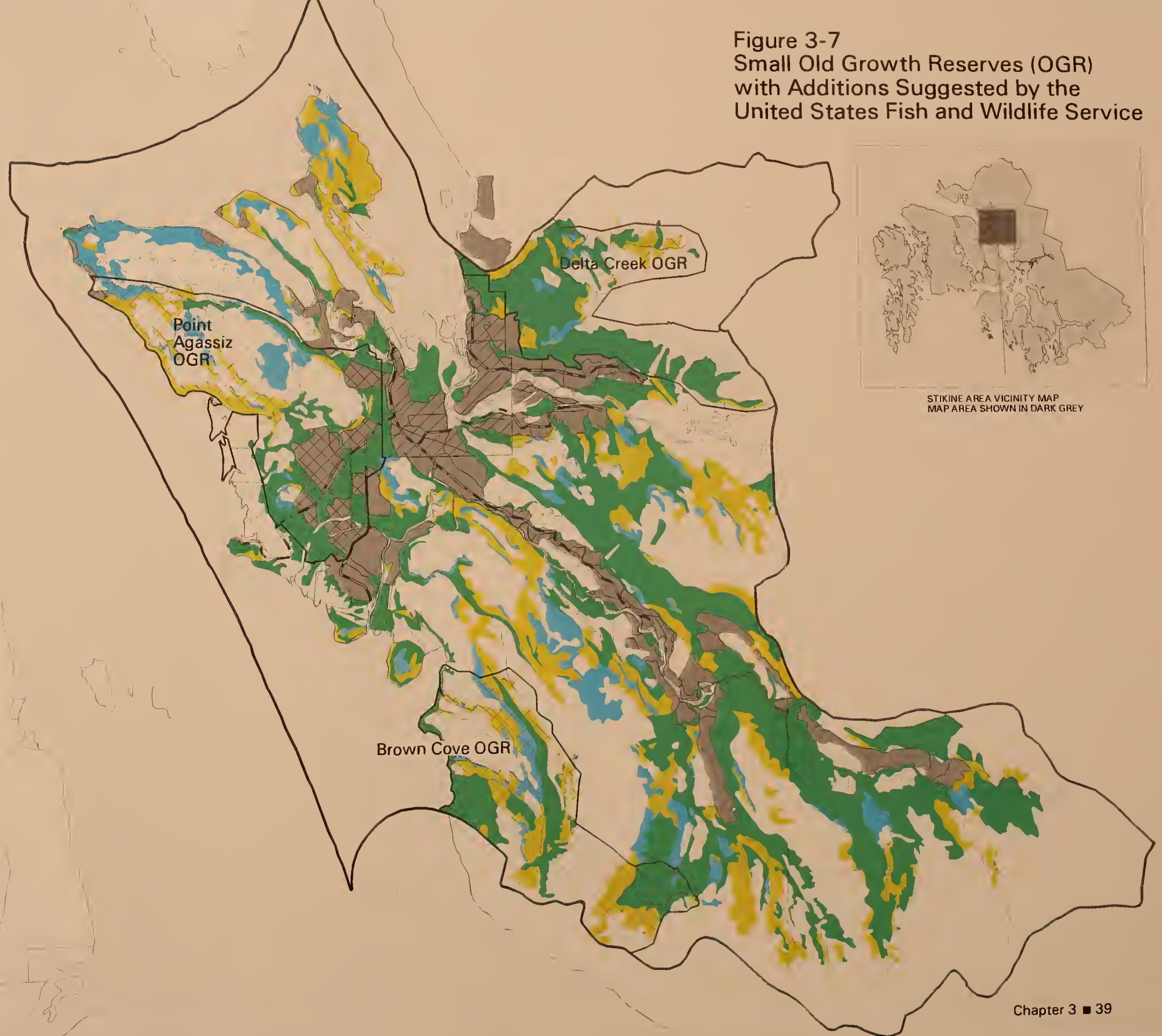
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  High Volume Strata
-  Medium Volume Strata
-  Low Volume Strata
-  Existing Managed Stands
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Old Growth Reserves
-  Log Transfer Facility (LTF)

Figure 3-7  
Small Old Growth Reserves (OGR)  
with Additions Suggested by the  
United States Fish and Wildlife Service



0 7920 15840  
Scale is 1 inch = 7920 feet







**Table 3-19.****Estimated Acres of Productive Old Growth Remaining After Timber Harvest By Alternative On the Forest Service Lands Within the Crystal Creek Project Area.**

Alternative	Acres Productive Old Growth After Timber Harvest	% of 1954 Total
1	22,278	81.9
2	21,565	79.3
3	21,526	79.1
4	21,558	79.3
5	21,808	80.2

### **Habitat Connectivity Between Reserves**

Another aspect of reserve design is to have habitat connectivity between the reserves. Habitat connectivity refers to a continuous strip of older forest between each reserve so that species can readily travel among reserves. Habitat connectivity may allow the movement of some species, like northern flying squirrels and is a desired condition of reserve design but it has not been demonstrated that this habitat condition is necessary for the movement of any species. The older second growth within the project area, that has trees 50 feet or more in height, may serve as a travel corridor for species that prefer a forested cover.

In all alternatives, there is limited habitat connectivity between the old-growth reserves due to the Muddy and Patterson Rivers and the previous harvest. There is an interruption in the old growth corridor between the Point Agassiz and the Brown Cove reserves at the mouth of the Muddy River due to past logging, the presence of estuarine meadows, and the Muddy River. Past logging and the presence of State land at the mouth of the Patterson River does not provide for an old growth corridor between Bock Bight and Delta Creek or a direct connection between the Point Agassiz reserve and the Patterson River. Extensive logging along the Muddy River precludes an old-growth forest corridor through the lowlands of the Muddy River that would connect the Brown Cove reserve to the Patterson River. The presence of extensive logging, glacial outwash areas dominated by shrubs, the Patterson River, and the Patterson Glacier all limit old-growth habitat connectivity across the Patterson River drainage. There is one area with the most contiguous old growth across this drainage about 4.5 miles upstream of the mouth of the river. Although this area is not designated as a travel corridor between reserves, it will not be affected by any of the alternatives.



### **Protection of High-Volume Old-Growth Forest Habitat**

A concern expressed by members of the public, the U. S. Fish and Wildlife Service, and the Alaska Department of Fish and Game was the preservation of unlogged forest habitat in volume classes greater than 30,000 board feet/acre (volume class 6+ old growth), especially in the area between Point Agassiz and State land. About 76% of the past logging occurred in volume class 6+ forests within the Project Area, about 57% of this volume class has been logged on state and federal lands. There are about 2,790 acres of unlogged volume class 6+ forests remaining on National Forest land within the project area.

There are no known species that exclusively require volume class 6+ forest, but some species prefer this habitat. Of the management indicator species selected for this environmental analysis, the brown creeper is the most dependent on Volume Class 6+ old growth. Brown creepers represent bird species that require forests with large, old-age trees for winter habitat. Brown creepers feed by picking insects and other small invertebrates out of cracks in the trunks of trees. Large-diameter trees provide a greater abundance of food than smaller trees and provide large snags that are important as roosting sites. In Southeast Alaska, the highest densities of brown creepers are found in the old-growth forests that exceed 30,000 board feet/acre. Old-growth stands with less than 20,000 board feet/acre, clearcuts, second-growth, deciduous forests, and nonforest vegetation do not provide suitable winter habitat for these birds. The Habitat Suitability Index (HSI) model for brown creepers suggest that its habitat has been reduced by 55% within the project area since 1954 (Table 3-21).

The amount of old growth with at least 30,000 board feet/acre that is protected in Old Growth Reserves, included in the harvest alternatives, or included in timber available for harvest that has tentatively been identified by the IDT is shown in Table 3-20.

**Table 3-20.**

**Amount of Volume Class 6+ Old Growth\* by Alternative.**

Volume 6+ in Tentatively Suitable Timber Within Current Logging Systems Plan	Acres By Alternative and % of 1954 Total **									
	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	acres	%	acres	%	acres	%	acres	%	acres	%
Vol. 6+ old growth in designated reserves	398	5	398	5	1125	15	398	5	398	5
Vol. 6+ in proposed timber harvest:										
clearcut/group selection	0	0	44	0.6	3	0.0	55	0.7	144	1.9
single-tree selection	0	0	70	0.9	11	0.1	237	3.1	405	5.2
total	0	0	114	1.5	14	0.2	292	3.8	549	7.1
Vol. 6+ left unlogged after proposed timber harvest	2836	37	2722	35	2822	36	2544	33	2287	30
Vol. 6+ old growth in tentatively suitable identified timber available for harvest***	1080	14	1080	14	542	7	1080	14	1080	14

\* Vol. 6+ Old Growth is all older, unlogged forests with at least 30,000 board feet/acre.

\*\* Percent of total Vol. 6+ old growth present in 1954 within the project area. 1954 was chosen as the base year to represent the prelogging condition of the project area. Percentage includes estimated amount on State and federal lands.

\*\*\* These figures include acres designated for harvest in the alternatives.

There are some substantial differences among the alternatives with regard to the protection of the highest-volume forests. The old-growth reserves in alternative 3 would protect about three times as much volume class 6+ old growth and reduce the volume class 6+ old growth available for harvest by half compared to the other alternatives (Table 3-20). The estimated amount of volume class 6+ old growth proposed for harvest ranges from 0 and 14 acres in Alternatives 1 and 3, respectively, to 549 acres in Alternative 5. The majority of the proposed timber harvest in the highest-volume forests would be single tree selection.

The impacts of the proposed alternatives on brown creepers are evaluated from the change in long-term carrying capacity predicted by the brown creeper Habitat Suitability Index (HSI) model. The model estimates that brown creeper carrying capacity will decline by about 0.6% in Alternative 3, 0.8% in Alternative 2, 0.9% in Alternative 4, and 1.8% in Alternative 5 (Table 3-21). No further decline in brown creeper habitat is expected in Alternative 1 (no-action). The greater decline in Alternative 5 relative to the other alternatives that harvest timber is due to the greater percentage of Vol. 6+ forests included in the harvest units. Overall, brown creeper habitat would be reduced from 55.5% to 57.3% in all alternatives compared to the 1954 estimate of pre-logging habitat potential.

**Table 3-21.**

**Estimated Changes in Brown Creeper Carrying Capacity Within the Crystal Creek Project area By Alternative.**

Alternative	Year	Estimated Brown Creeper Carrying Capacity (# of animals)	Percent Change From 1954	
			Alternative Change	Cumulative Change
1	2000	607	0	-55.5
2	2000*	595	-0.8	-56.3
3	2000*	598	-0.6	-56.1
4	2000*	594	-0.9	-56.4
5	2000*	582	-1.8	-57.3

\* For the purposes of display and analysis it is assumed the timber harvest proposed in the alternatives will occur by Year 2000.

### Effects of Timber Harvesting Activities on Old-growth Associated Wildlife Species

In order to estimate the effects of the alternatives on wildlife species, management indicator species are chosen for analysis. These species are used to predict how management activities may affect species with similar habitat requirements. This concept reduces the total number of species to be analyzed.

Thirteen species have been identified as Forest-wide management indicator species in the Forest Plan. All, except for the brown bear, have well-established populations within the project area. Six Forest-wide management indicator species (deer, mountain goats, marten, wolves, brown creeper, and Canada geese) plus moose as a project management indicator species were chosen to evaluate the environmental impacts of this project. Marten, deer, goats, wolves, and Canada geese are analyzed in this section.



The U.S. Fish and Wildlife Service asked that the impacts of the timber harvest on brown bear be examined. Brown bear is not used as a management indicator species because it is extremely uncommon within the project area. Based on extensive field observations and anecdotal accounts, there is no evidence of a viable brown bear population within the project area for at least the past 40 years (Doerr 1997b).

The Forest Plan developed habitat capability models to estimate pre-logging, 1954 to present, and future habitat potential for each of the Forest-wide management indicator species. These models are used primarily as relative measures of the effects of Forest management activities on wildlife habitat. Model outputs are generally expressed in terms of population numbers. These population numbers should not be confused with the actual numbers of a given species within the area. Actual population numbers of a species can vary widely from year to year as a result of many factors other than optimum habitat potential. These models have not had extensive field testing, and the numbers projected for each species serve as rough benchmarks to compare impacts among alternatives.

### *Marten*

Marten represent species that need habitat in higher-volume old growth forests and are negatively affected by the presence of clearcuts, pole timber, and young sawtimber (Figure 3-8). Marten have been one of the key species protected through the establishment of well-distributed, old-growth reserves in the Forest Plan. The HSI model for marten suggests that marten habitat has been reduced by about 14% since 1954.

The impacts of the proposed alternatives on marten are evaluated from the change in long-term carrying capacity predicted by the marten HSI model and by the change in miles of Forest Service roads open to motorized access. The results of the HSI model are shown in Table 3-22. This model estimates that marten carrying capacity will decline about two percent in Alternatives 2 through 5 compared to Alternative 1 (no action). The proposed timber harvest in Alternatives 2 through 4 are expected to result in the loss of about two marten within the project area. Alternative 5 is expected to result in the loss of about one marten within the project area. By 2040, marten habitat capability is expected to be reduced to 86% of the 1954 value in Alternative 1 and to about 84% of the 1954 value in the action alternatives.

Table 3-22.

**Estimated Changes in Marten Carrying Capacity Within the Crystal Creek Project Area By Alternative.**

Alternative	Year	Percent Change from 1954		
		Alternative Change	Cumulative Change*	Estimated Marten Carrying Capacity (# of animals)
1	2000	0	-14	99
	2040	0	-14	99
2	2000**	-2	-16	98
	2040	-2	-16	97
3	2000**	-2	-16	98
	2040	-2	-16	97
4	2000**	-2	-16	98
	2040	-2	-16	97
5	2000**	-2	-16	98
	2040	-2	-16	98

\*Cumulative change is the percent carrying capacity change from 1954, -14%, added to the percent change for each alternative.

\*\*For the purposes of this analysis it is assumed the timber harvest proposed in the alternatives will occur by 2000.

Roads may impact marten by increasing harvest due to improved access. The marten HSI model assumes that marten densities will begin to decrease as road densities begin to exceed 0.2 mile of open roads/square mile, and at 0.6 mile of open road/square mile, marten densities will decline by 90% due to trapping pressure. Currently, within the project area, there are 23 miles of open roads, including an estimated four miles of temporary roads and two miles of roads on private lands, which equates to a road density of about 0.23 mile/sq. mile within the project area.

In all alternatives, the miles of roads on Forest Service land within the project area that are readily accessible for marten trapping are not expected to significantly change after the sale or to have significant long-term negative effects on marten populations within the project area. In all alternatives, the IDT is proposing to close all new road construction after timber harvest and to prohibit motorized access into the Crystal Creek drainage by the general public during and after timber harvest. In addition, the IDT assumes that all existing open temporary roads will be closed as funds become available. The only new road access that would be open to the public after timber harvest would be 2.7 miles of reconstructed roads in Alternatives 2, 4, and 5 and 4.3 miles of reconstructed roads in Alternative 3. In Alternative 1, the open road density would decline to 0.19 mile/sq. mile since 4 miles of open temporary roads will be closed. In Alternatives 2, 4, and 5, the open road density would decline slightly to 0.22 mile/sq. mile. In Alternative 3, the open road density will increase slightly to 0.24 mile/sq. mile after timber harvest and the closing of existing open temporary roads (Table 3-23).



# Legend















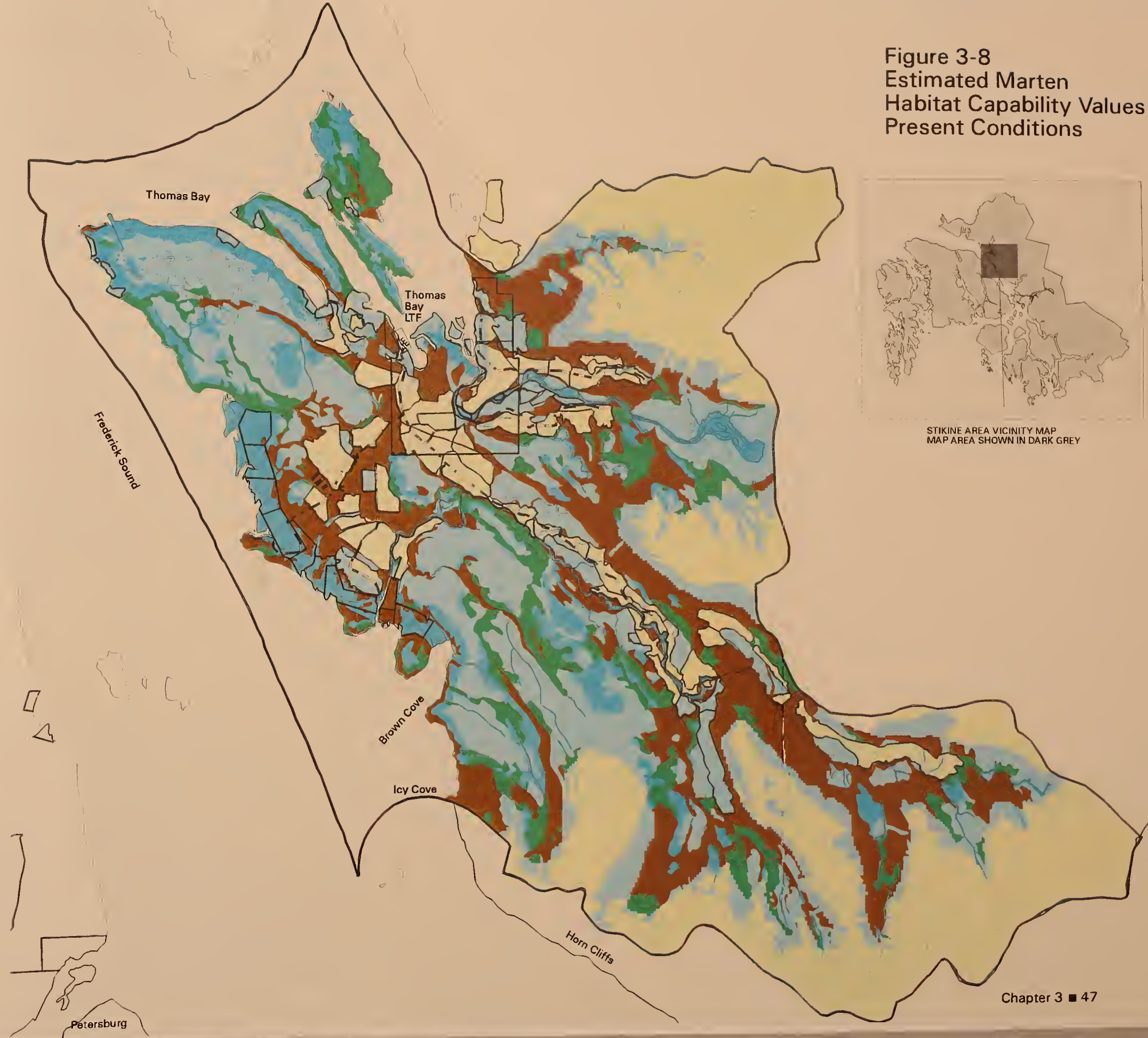
-  Existing Managed Stands
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  0.9 to 1.0 (Best Marten Habitat)
-  0.6 to 0.89
-  0.3 to 0.59
-  0.1 to 0.29
-  0.01 to 0.09 (Poor Marten Habitat)
-  0 (No Value)
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

Figure 3-8  
Estimated Marten  
Habitat Capability Values  
Present Conditions



0 7920 15840  
Scale is 1 inch = 7920 feet

gis/projects/crystal/plots/deisplots2/marten.map 09/25/97

Crystal Creek Timber Harvest Draft EIS





**Table 3-23.**  
**Estimated Changes in Open Road Densities By Alternatives.\***

Alternative	Miles of Open Forest Service Development Roads	Miles of Open Forest Service Temporary Roads	Total Open Road Density≈ (mile/sq.mi)
Present	17.2	4.0	0.23
1	17.2	0.0	0.19
2	19.9	0.0	0.22
3	21.5	0.0	0.24
4	19.9	0.0	0.22
5	19.9	0.0	0.22

\* Results shown are the anticipated long-term changes after project implementation and include the effects of a proposed motorized closure to public access on the bridge crossing of the Muddy River into Crystal Creek in Alternatives 2, 3, and 4 and closure of temporary roads.

≈ Road densities include an estimated two miles of open roads on private lands.

### *Sitka Black-Tailed Deer*

Sitka black-tailed deer is a management indicator species that prefer higher volume old-growth forest for winter habitat and are an important sport hunting and subsistence species. Young clearcuts provide poor winter habitat because they lack overstory canopies that can intercept snowfall (Wallmo and Schoen 1980). Pole stands are typically poor winter habitat because they generally have closed canopies that shade out understory forage species. Important deer wintering areas within the project area include Ruth Island, the beach fringe forest on the Bock Bight and Point Agassiz Peninsulas, the river terrace forests along the lower one mile of the Patterson River (on State land), the higher volume forests in the lower two miles of the Muddy River drainage inland, and the forested hillsides adjacent to Frederick Sound from the mouth of the Muddy River to Horn Mountain (Figure 3-9).

The Forest Plan deer model was modified for this project to account for thinning, single-tree selection harvest, and group selection harvest. Thinning should maintain the shrub-sapling understory in clearcuts for 20 years after treatment. Therefore, the loss of understory will not occur until clearcuts reached 30 years of age. Openings created by group selection harvest would affect deer habitat similar to clearcutting. If 30% of a unit was harvested by group selection, the harvested 30% would have deer habitat values similar to a clearcut and the other 70% of the unit would have old growth values. Based on observations gathered on one site, single-tree selection harvest which removed up to 40 percent of the basal area would not negatively affect deer habitat. The Forest Plan deer panel model assumes that 36% of the deer are available for wolves and the remainder of the deer comprise the population that supports sport and subsistence hunting.

The project area deer model suggests that deer habitat capability has been reduced by about 19% since 1954. Pellet-group counts in the spring of 1996 in VCU 489 suggest a healthy deer population (Kirchhoff 1996).














Impacts of the proposed alternatives on deer are evaluated from the changes in long-term carrying capacity predicted by the project area deer model (Table 3-24). This

model estimates that deer carrying capacity will decline by about 2 percent in Alternatives 2 through 5 compared to Alternative 1 (no action). The proposed timber harvest in Alternatives 2, 3, 4, and 5 is expected to result in a long-term decline of carrying capacity equivalent to 27, 32, 30, and 26 deer after wolf predation. If 1,720 acres of existing second growth is thinned or otherwise treated to prolong understory then habitat to support an estimated 23 additional deer would be maintained for about 20 years. By 2040, deer habitat capability is expected to be reduced to 79.1% of the 1954 (prelogging) value in Alternative 1 and to about 77.1 to 77.5% of the 1954 value in Alternatives 2 through 5.

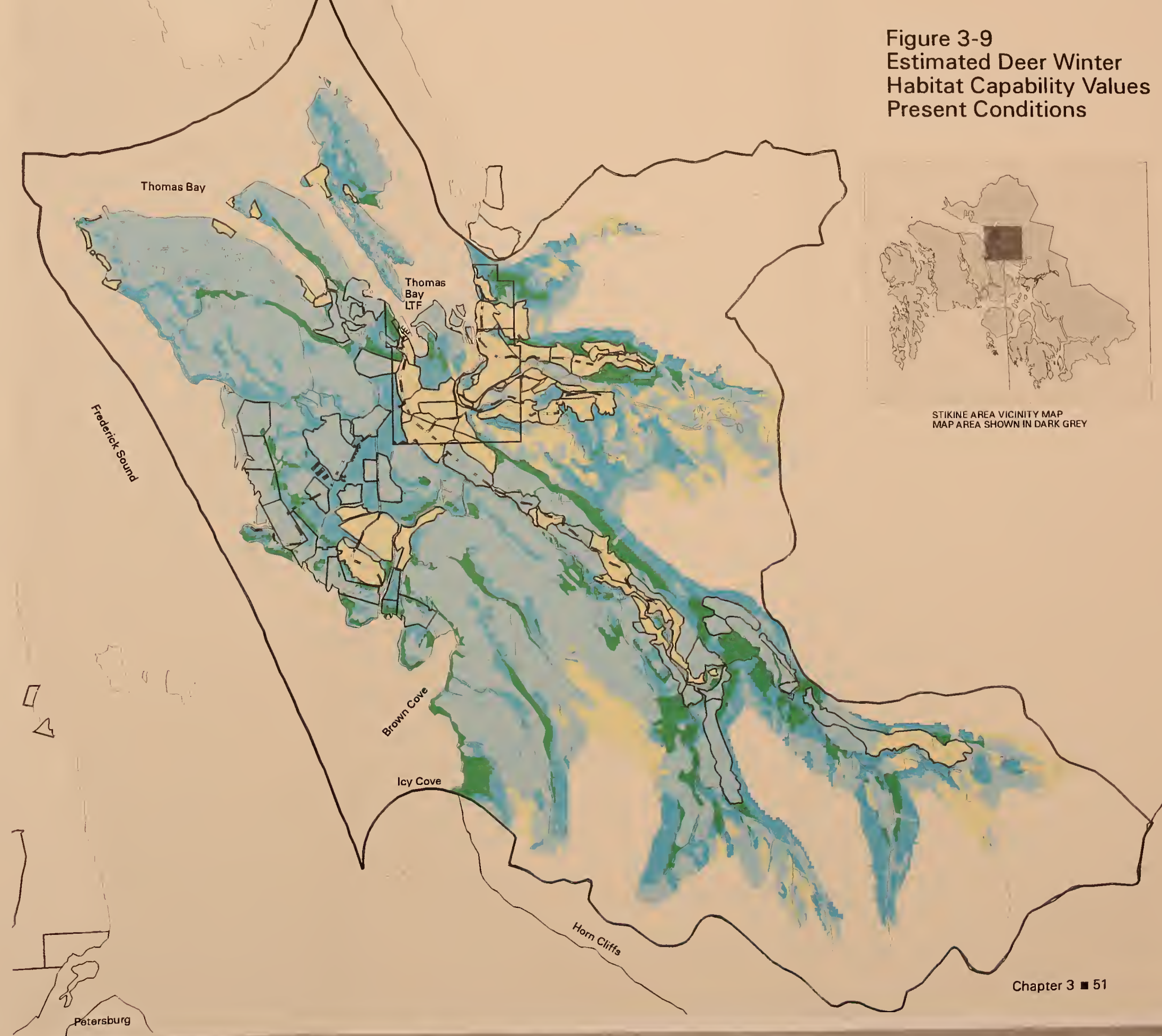
The effects of declines in deer habitat potential on subsistence hunting and wolf populations are discussed under Subsistence.



# Legend

-  Existing Managed Stands
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  0.6 or above (Best Deer Winter Habitat)
-  0.3 to 0.59
-  0.1 to 0.29
-  0.01 to 0.09 (Poor Deer Winter Habitat)
-  0 (No Value)
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

**Figure 3-9**  
**Estimated Deer Winter**  
**Habitat Capability Values**  
**Present Conditions**



STIKINE AREA VICINITY MAP  
 MAP AREA SHOWN IN DARK GREY

0 7920 15840  
 Scale is 1 inch = 7920 feet



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**Table 3-24.**  
**Estimated Changes in Deer Carrying Capacity By Alternative.**

Alternative	Year	Estimated Deer Carrying Capacity (# of animals*)	Percent Change From 1954	
			Alternative Change	Cumulative Change
<b>1</b> <i>w/thinning**</i>	2000	1,343	0	-18.7
	2010	1,317	0	-20.3
	2010	1,340	+1.0	-19.3
	2040	1,306	0	-20.9
<b>2</b> <i>w/thinning**</i>	2000***	1,324	-1.2	-19.9
	2010	1,299	-1.1	-21.4
	2010	1,322	-0.1	-20.4
	2040	1,279	-1.7	-22.6
<b>3</b> <i>w/thinning**</i>	2000***	1,317	-1.6	-20.3
	2010	1,293	-1.4	-21.7
	2010	1,316	-0.4	-20.7
	2040	1,274	-2.0	-22.9
<b>4</b> <i>w/thinning**</i>	2000***	1,323	-1.3	-20.0
	2010	1,297	-1.2	-21.5
	2010	1,320	-0.2	-20.5
	2040	1,276	-1.9	-22.8
<b>5</b> <i>w/thinning**</i>	2000***	1,323	-1.3	-20.0
	2010	1,298	-1.1	-21.4
	2010	1,321	-0.1	-20.4
	2040	1,280	-1.6	-22.5

\* Deer numbers shown are the estimated deer habitat potential after 36% of the deer have been removed to account for wolf predation and include past logging on State lands.

\*\* This simulation shows the estimated effects of thinning or pruning approximately 1,720 acres of existing second growth to prolong forage for moose and deer. The silvicultural treatments are assumed to occur between 1997 and 2010 and to prolong understory in clearcuts for about 20 years.

\*\*\* For the purposes of display and analysis it is assumed the timber harvest proposed in the alternatives will occur by Year 2000.



## *Mountain Goat*

Mountain goats are an indicator species for animals that prefer old-growth forests within proximity to cliffs and subalpine habitat and are an important species for sport hunting and subsistence. The HSI model for mountain goats assumes that the preferred winter habitats are old-growth forests on southerly aspects within 400 meters of cliffs and subalpine habitats and rock outcrops on southerly aspects. Mountain goats have also been observed using windswept alpine ridge tops within the project area during the winter, similar to winter habitat use patterns reported in more northern portions of Southeast Alaska. Clearcuts and pole stands are both assumed to be poor winter habitat.

The HSI model assumes that road and trail access within two miles of goat habitat will reduce habitat carrying capacity because of increased human disturbance and increased hunting pressure. Within the project area, this has not been the case. The road to the upper Muddy River drainage accesses a very high-use goat wintering area, but there is no evidence that human disturbance or hunting have reduced the habitat potential. This is partly because mountain goats concentrate in this area during periods of deep snowfall, which usually occurs after the hunting season. Despite considerable road access within or adjacent to goat habitat, there has been relatively little hunting pressure on goat populations within the project area.

Important goat habitat areas include the Delta Creek watershed, slopes north of the Patterson River, the mouth of the Patterson Glacier, alpine/subalpine habitats of Horn and Thunder Mountains, the steep hillside east of Crystal Creek, the mountain range southeast of Ess Lake, and the south facing slopes along the Muddy River. Recent field work indicates that goats winter extensively in the forests throughout the Crystal Creek drainage, along the south side of the upper Muddy River drainage, and on the steep north-facing portion of the Ess Creek drainage. A relatively large goat population that receives substantial hunting pressure occurs in the Stikine-LeConte Wilderness Area of Horn Cliffs to the south of the project area. Concern was expressed by the public and by management agencies that improved road access in the Crystal Creek drainage would increase harvest of the Horn Cliffs goat population.

The effects of the alternatives on mountain goats are evaluated by the amount of harvest in goat habitat and the increase in human access to the Horn Cliffs area. The amount of new openings proposed in goat winter range is ranked as follows: Alternative 1 (0 acres), Alternative 5 (210 acres), Alternative 2 (257 acres), Alternative 4 (267 acres), and Alternative 3 (466 acres). Much of this habitat is considered marginal winter range by the current HSI model for goats. Assuming a winter carrying capacity of 2.3 goats/square mile for this habitat (i.e. 20% of the carrying capacity value of the very best goat habitat), the long-term loss in carrying capacity follows: Alternative 1 (0 goats), Alternative 5 (0.8 goat), Alternative 2 (0.9 goat), Alternative 4 (1.0 goat), and Alternative 3 (1.7 goats).

The 1500-foot vertical and horizontal buffers will be maintained between logging activities and any known kidding areas or other important traditional summer goat habitat areas. Helicopter activities associated with logging will be seasonally restricted to avoid these areas.

Alternatives 1 and 5 would not construct any new roads in the Crystal Creek drainage. A motorized vehicle closure is proposed at the proposed road crossing of the Muddy River into the Crystal Creek drainage in Alternatives 2, 3, and 4, officially closing the Crystal Creek drainage to motorized access by the public, including goat hunters during and after timber harvest. Newly constructed roads in the Crystal Creek drainage will be closed after timber harvest, further restricting access. This road closure is proposed, in part, to minimize the potential of hunters to overharvest the Horn Cliffs goat population. The shortest distance between the alpine habitat of Horn Mountain, above 2000 feet elevation and closed roads is about 1.75 miles in Alternatives 1 and 5, 0.6 mile in Alternatives 2 and 3, and 0.15 mile in Alternative 4.

Some increase in goat hunting is anticipated in the Upper Muddy River drainage and the mountain range above Ess Lake in all action alternatives. Both these areas have relatively large goat populations that presently receive little hunting pressure and are adjacent to vast areas of pristine goat country. No overharvest of these goat populations is anticipated in any of the alternatives. Goat harvests are monitored yearly by the Alaska Department of Fish and Game and further road closures will be considered if overharvest of goats is indicated by the harvest data.

#### *Alexander Archipelago wolf*

The project area supports a relatively high density of wolves. The abundance of wolves is attributed to the presence of deer, moose, and mountain goats, plus a high density of beaver. No wolf denning sites are known within the project area, but a post-denning rendezvous site was located by a Forest Service biologist in a grass meadow above Ess Lake in 1979.

The wolf model assumes that the availability of prey may directly affect the habitat capability of wolves, except that territorial behaviors constrain densities at a maximum of one wolf/10 square miles, regardless of prey availability. Table 3-25 shows changes in prey and estimated wolf numbers for each alternative. In all alternatives, the wolf model suggests that wolves will be limited by their territorial constraints rather than the availability of prey. Consequently, changes in moose, deer, and goat habitat potential are not expected to reduce wolf populations within the project area for any action alternative.



Table 3-25.

**Estimated Changes in Wolf Prey Populations and Wolf Populations By Alternatives, Crystal Project Area.**

Alternative	Year	# Moose*	# Deer **	Pounds of Available Biomass <sup>γ</sup>	No. of Wolves <sup>ρ</sup>
1 w/out thinning <sup>δ</sup> with thinning <sup>δ</sup>	2010	182	2071	42,802	10
	2010	206	2107	44,093	10
	2040	167	2051	42,040	10
2 w/out thinning <sup>δ</sup> with thinning <sup>δ</sup>	2010	191	2041	42,487	10
	2010	214	2077	43,752	10
	2040	163	2010	41,183	10
3 w/out thinning <sup>δ</sup> with thinning <sup>δ</sup>	2010	189	2040	42,415	10
	2010	212	2076	43,680	10
	2040	165	2011	41,253	10
4 w/out thinning <sup>δ</sup> with thinning <sup>δ</sup>	2010	191	2038	42,432	10
	2010	214	2074	43,697	10
	2040	163	2004	41,072	10
5 w/out thinning <sup>δ</sup> with thinning <sup>δ</sup>	2010	189	2040	42,415	10
	2010	212	2076	43,680	10
	2040	165	2011	41,253	10

\* The number of moose is estimated from the moose HSI model assuming a 1980 habitat capability of 250 moose and assuming that future moose populations are at the projected habitat capability.

\*\* The number of deer is estimated from the project area deer HSI model assumes that future deer populations are at the projected habitat capability.

<sup>γ</sup> Assumes that 36% of the deer are available to wolves (DeGayner 1996) and that 5% of the moose are available to wolves. Also assumes that the average deer and moose weigh 68 and 700 pounds, respectively, and that 75% of the carcass is edible (United States Dept. of Agriculture - Forest Service 1991a).

<sup>ρ</sup> Wolf numbers estimated assuming that each wolf requires 9.7 pounds of prey/day and that wolf population densities do not exceed one per 10 square miles. Goat prey biomass within the project area is not included in the calculations so the estimates of available prey are conservative for the project area.

<sup>δ</sup> Thinning assumes that about 1,720 acres of existing second growth are thinned or otherwise treated to prolong forage for moose and deer. The silvicultural treatments are assumed to occur between 1997 and 2010 and to prolong understory in existing clearcuts for about 20 years.



Roads may impact wolves by increasing human harvest due to improved access. The Forest Plan wolf panel made no recommendations regarding a maximum road density (Person et al. 1996). However, the U. S. Fish and Wildlife Service has recommended that open road densities be kept below 0.7 mile/ square mile during and after project implementation (Allen 1997). Currently, within the project area, there are 23 miles of open roads and about 36 miles of shoreline. This equates to 59 miles of access within about a 100 square mile area (VCUs 487 and 489). The current density of 0.59 mile of access/sq. mile has resulted in a recent yearly average wolf harvest of about one wolf/45 miles of open access roads and shoreline.

Currently the IDT proposes to close all newly constructed temporary roads after timber harvest and to have a motorized vehicle closure to public access during timber harvest at the proposed Muddy River crossing by Crystal Creek. Alternatives 2 through 5 propose to construct/reconstruct between 14 and 23 miles of road. Only 2.7 miles of reconstruction in Alternatives 2, 4, and 5, and 4.3 miles of reconstruction in Alternative 3 are proposed to remain open to the general public after timber harvest. In addition, about four miles of currently open temporary roads are proposed for closure. Road miles and densities are estimated for each alternative, assuming all new roads are open, and then assuming that all new roads and existing open temporary roads are closed (Table 3-26).

None of the alternatives would exceed the road density concern of the U. S. Fish and Wildlife Service for wolves (Allen 1997), even without the proposed road closure at the Muddy River crossing into Crystal Creek. The maximum short-term density would be 0.46 mile of roads/square mile without road closures. After timber harvest, all alternatives, except Alternative 3, would have slightly fewer miles of road access than currently exist, as existing open temporary roads and newly constructed roads are closed.

If wolf harvests are directly related to miles of access, the average yearly wolf harvests within the project area would be less than 1.8 wolves/year during timber harvest under all alternatives and assuming no road closures. This level of harvest would not be excessive, given the size of the area and the estimated number of wolves the area is capable of supporting. The harvest of wolves will be monitored within the project area through the State sealing requirements and, if excessive wolf harvests occur, additional road access restrictions and/or hunting and trapping restrictions may be necessary. The viability of wolves is further protected by the presence of the Stikine-LeConte Wilderness and roadless areas bordering the project area on three sides which provide sources for wolf immigration into the area if the wolf population becomes low.

**Table 3-26.**

**Estimated Miles and Densities of Road/Shoreline Access and Resulting Wolf Harvests By Alternative, VCUs 487 and 489**

	Maximum Possible Miles of Access During Sales ≡	Post Sale **
<b>Alternative 1</b>		
Shoreline & open road miles	59*	55
Miles of access/sq. mile	0.59	0.55
Road miles/ sq. mile	0.23	0.19
Estimated yearly wolf harvest	1.3 <sup>fb</sup>	1.2
<b>Alternative 2</b>		
Shoreline & open road miles	80	58
Miles of access/sq. mile	0.80	0.58
Road miles/ sq. mile	0.44	0.22
Estimated yearly wolf harvest	1.8	1.3
<b>Alternative 3</b>		
Shoreline & open road miles	77	60
Miles of access/sq. mile	0.77	0.60
Road miles/ sq. mile	0.41	0.24
Estimated yearly wolf harvest	1.7	1.3
<b>Alternative 4</b>		
Shoreline & open road miles	82	58
Miles of access/sq. mile	0.82	0.58
Road miles/ sq. mile	0.46	0.22
Estimated yearly wolf harvest	1.8	1.3
<b>Alternative 5</b>		
Shoreline & open road miles	73	58
Miles of access/sq. mile	0.73	0.58
Road miles/ sq. mile	0.37	0.22
Estimated yearly wolf harvest	1.6	1.3

≡ Assumes all roads are constructed and open before any roads are closed.

\*Includes 36 miles of shoreline, 17 miles of open forest development roads, an estimated four miles of open temporary roads, and an estimated 2 miles of open roads on private lands.

\*\* Assumes the four miles of open temporary roads will be closed and that all new roads will be closed post-sale. Assumes that about 2.7 miles of reconstructed road would remain open after the sale in Alternatives 2, 4, and 5, and 4.3 miles of reconstruction would remain open in Alternative 3.

<sup>fb</sup> From 1987-95, an average of 1.3 wolves annually have been harvested within VCUs 487 and 489, given 59 miles of shoreline and open roads. Future harvests are assumed to be proportional to the miles of open roads and shorelines.



### *Vancouver Canada Geese*

Vancouver Canada geese represent species that utilize wetland forests and forests in proximity to surface water for nesting and brood rearing (Suring 1993). Adequate nesting and brood rearing habitat is assumed to be the limiting habitat factor in the HSI model for geese. Clearcuts are assumed to have zero habitat value because of a lack of overstory nesting cover, although nesting geese and geese with broods have been observed in clearcuts within the project area. Pole stands are assumed to have zero value because of very low understory production.

Nesting by Canada geese is common within the project area, due partly to the high abundance of forested wetlands and old growth adjoining ponds, lakes, and sloughs. Although few goose nests have actually been found, adult pairs are seen throughout the lowland area during the spring nesting season. A pair of adult geese with young was observed in a wetland slough within a clearcut west of the lower portion of the Muddy River. Concentrated goose nesting has been found in the grass flats surrounding Point Agassiz and a few nests in trees have been found in the old growth and clearcuts between Point Agassiz and Thomas Bay. Dozens of geese have been observed molting on a lake on the northwest side of Ruth Island and foraging on skunk cabbage in a nearby clearcut. The estuarine meadows and mudflats at the mouths of the Patterson River and the Muddy River and adjacent to Point Agassiz are important wintering areas for geese and other waterfowl within the project area.

Wetlands that are known or likely to be used by waterfowl, primarily geese, for nesting, brooding, and rearing have been identified within the project area. Buffers of 330-foot width have been placed around these wetlands. Within this buffer, harvest is generally limited to single tree-selection of 40% or less, group selection harvest of 0.5 acre or less, and salvage logging of downed trees. Timing clauses have been placed on these buffers to restrict tree falling and yarding during the period April 1 to July 31. Because geese within the project area show a high incidence of nesting in trees, some large-diameter live trees will be topped within the units to provide for future nest sites and snags and dying trees will be emphasized in the retention of reserve trees. (See Appendix B - Unit and Road Cards.)

Because Canada geese nest extensively throughout the project area, some disruption of nesting and brood-rearing is likely in all alternatives that harvest timber and treat second growth, despite the above protective measures. The likelihood of each alternative to disrupt goose nesting is ranked by alternatives based on the number of timber harvest units near or within wetland areas where nesting is believed to be most likely. The alternatives are ranked as follows: Alternative 1 (0 units - least likely to disrupt goose nesting/brood rearing), Alternative 3 (3 units), Alternative 4 (7 units), Alternative 2 (9 units), and Alternative 5 (20 units-most likely to disrupt goose nesting/brood rearing).

### *Harlequin Duck*

The U. S. Fish and Wildlife Service requested that the effects of the proposed timber harvest on harlequin ducks be evaluated. The harlequin duck is a common year-round bird in Southeast Alaska (Gabrielson and Lincoln 1959). They spend most of the year in saltwater within the intertidal and subtidal areas, but generally nest near swift-flowing freshwater streams. Few nests have been located in Southeast Alaska. No nesting pairs have been documented within the project area.



The 1000-foot beach and estuarine buffers will protect important wintering, migration, and summer foraging habitat of waterfowl in all alternatives. Riparian buffers would protect the most likely harlequin duck nesting habitat in all alternatives.

### Maintaining Species Diversity

All alternatives are expected to maintain all naturally occurring species within the project area. The risk of extinction of old growth associated species will be minimized by the high percentage of old growth retained after harvest and the large amount of natural areas surrounding the project. Mitigation measures, such as reserve trees, single-tree selection harvest methods, nest buffers, timing clauses on logging activities and second growth treatment will provide protection to wildlife species.

Logging proposed in all the action alternatives will help maintain habitat for species that favor young forests and roadside edges (Table 3-27). No further logging and silvicultural treatment of second growth could pose some risks to these species. Some early forest habitats would be maintained by natural processes, such as blowdown, landslides, flooding, and glacial retreat.

**Table 3-27.**

**Estimated Acres of Second Growth with High Understory Production By Alternative**

Acres Second Growth With High Understory Production*				
Alternative**	1997	2000***	2020	2040
1	4460	4110	10	0
2	4460	4830	720	0
3	4460	4870	760	0
4	4460	4840	730	0
5	4460	4580	480	0

\* Acres are estimated by assuming that unthinned clearcuts will maintain understory for 30 years and that thinning and pruning will maintain understory for an additional 20 years after treatment. Acres include only managed forests and do not show young forests created by natural processes.

\*\* In 1997, 273 acres of second growth that would otherwise lose understory production were thinned and pruned. These acres are included in the above estimates of future second growth with high understory production.

\*\*\* For the purposes of analysis and display, it is assumed that all logging proposed in the Crystal Creek Timber Harvest will occur by 2000 and that no further silvicultural treatment or logging will occur after 2000. The latter assumption is used only to display the temporary increase in understory that would result from each alternative. Subsequent timber harvest is planned according to the silvicultural prescriptions. See Appendix B - Unit and Road Cards.

## Subsistence

With the passage of the Alaska National Interest Lands Conservation Act (ANILCA), the U.S. Congress recognized the importance of subsistence resource gathering to the rural communities of Alaska. ANILCA (16 USC 31130) defines subsistence as:

'The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade.'

ANILCA provides for the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on public lands. It also legislates that customary and traditional subsistence uses of renewable resources shall be the priority consumptive uses of all such resources on the public lands of Alaska. Non-rural residents are not provided a preference for the taking of fish and wildlife on public lands. Juneau and Ketchikan are the only communities in Southeast Alaska that have been determined to be non-rural by ANILCA and the Federal Subsistence Board.

Prior to 1997, the project area was not recognized as a subsistence area for moose hunting. Also, rural residents from Petersburg and the City of Kupreanof did not have a subsistence priority for mountain goat hunting even though other rural Alaska residents had this priority. In 1997, the Federal Subsistence Board reviewed the Customary and Traditional determinations in the project area and changed the subsistence priority for mountain goat hunting to include only rural residents of Alaska Game Management Units 1B and 3, which includes the residents of Petersburg and the City of Kupreanof. In addition, the Federal Subsistence Board recognized a subsistence priority for moose hunting in the project area for all rural residents in Alaska Game Management Units 1-4, which includes most of Southeast Alaska.

Currently, there is a mountain goat subsistence season for all qualified rural residents. However, the Federal Subsistence Board has not yet opened a subsistence season for moose hunting, so there is only a sport season for moose under state regulation within the project area. For this reason, moose are not analyzed as a subsistence species in this document. The effects of the alternatives on moose harvest has been presented under Issue 2.

### **Communities Traditionally Using the Crystal Creek Project Area**

Subsistence use areas and the levels of harvest were estimated from a variety of sources. Alaska Department of Fish and Game records the level of community harvests for select species, such as deer, marten, goat, black bear, wolf, and otter, within specific areas referred to as Wildlife Analysis Areas (WAAs). For the purpose of harvest reporting, VCU 487 and 489, which comprise the project area, are contained within the Alaska Department of Fish and Game's Wildlife Analysis Area (WAA) 1605. WAA 1605 also contains VCU 488, which is outside the project area. However, since VCU 488 is largely an inaccessible glacier-dominated landscape which receives little hunting pressure, the reported harvest in WAA 1605 (Table 3-28) closely corresponds to the harvest within the project area.



**Table 3-28.**

**Comparison of Subsistence and Non-subsistence Harvest of Important Game Species Within WAA 1605**

Species	Communities	Years	Average Harvest*	% Total Harvest
Deer	Subsistence Petersburg	1987-95	47.8	98
	Nonsubsistence Alaska		1.0	2
	Total Deer Harvest		48.8 (16-85)#	
Goat	Subsistence Petersburg	1989-95	1.6	74
	Nonsubsistence Alaskan		0.4	21
	Nonresident		0.1	5
	Total Goat Harvest		2.1 (0-7)#	
Black Bear	Subsistence Petersburg	1987-95	0.6	62
	Nonsubsistence Nonresident		0.3	38
	Total Black Bear Harvest		0.9 (0-2)#	
Wolf	Subsistence Petersburg	1987-95	1.3 (0-6)#	100
Otter	Subsistence Petersburg	1987-95	2.8 (0-10)#	100
Marten	Subsistence Petersburg	1987-95	11.6 (0-34)#	100

\* Source of goat, black bear, wolf, otter, and marten data is unpublished Alaska Department of Fish and Game harvest data (Crain 1996). Source of deer data is Alaska Department of Fish and Game (1996). The harvest within WAA 1605 closely corresponds to the harvest within the project area since little hunting and trapping is believed to occur in VCU 488.

# Range of annual harvests in parentheses.

Alaska Department of Fish and Game harvest data and Tongass Resource Use Cooperative Survey (TRUCS) maps reveal subsistence use areas for deer, salmon, marine invertebrates, nonsalmon finfish, and marine mammals within the project area. Other sources of subsistence use information came from public testimony and published accounts of community use surveys.



The information sources reveal that Petersburg residents use the Crystal Creek Project Area extensively for subsistence harvest, especially for deer, fish, crab and shrimp, and, to a lesser degree, goats, black bear, and furbearers. The area surrounding Horn Mountains which borders the south side of the project area is one of the most important goat hunting areas for the community of Petersburg. Residents of Wrangell also make limited use of the project area for hunting deer, and marine mammals, but fish extensively in the area. Little recent harvest within the project area was reported by Kake residents, although people reported that the area was formerly used by Kake for fish gathering, goat hunting, collecting goat hair, and fur trapping. Other rural southeastern Alaskan communities with reported fish and wildlife gathering activities within the area, but not significant use, include Haines, Port Protection, Edna Bay, Sitka, and Coffman Cove.

### **Types and Amounts of Resources Gathered**

Subsistence resources most intensively gathered by the communities of Petersburg and Wrangell near the Crystal Creek Project Area are deer, salmon, halibut, and shellfish.

### **Areas Most Often Used for Subsistence Activities**

The most popular areas for subsistence fishing include the marine waters of Frederick Sound and Thomas Bay and the freshwater lakes, ponds, and streams. The tidal environments from Icy Cove north to the Point Agassiz Peninsula and along the north shoreline of the Point Agassiz Peninsula between Wood Point and Bock Bight, plus the waters of Thomas Bay north of Ruth Island, are used to gather marine invertebrates, primarily shrimp and crab. A commercial dungeness crab fishery occurs in the waters near the Patterson River, and it is likely that some subsistence crab harvest occurs there.

Deer, black bear, and furbearer hunting and trapping occurs throughout the project area along the existing road system, as well as the beach-fringe and inland forests. Ruth Island, Bock Bight Peninsula, Point Agassiz Peninsula, and the area south of the Muddy River to Icy Cove are all popular places within the project area to hunt for deer. Goat hunting occurs in the mountainous terrain throughout the area, with the most concentrated use being around Horn Mountains and Swan Lake outside the project area. Concern was expressed that further roading in the Crystal Creek drainage would increase access to the Horn Cliffs goat population and could result in overharvest.

**Table 3-29.**  
**Subsistence Resource Use by Project Area Communities.**

Resources	Pounds per Household	
	Petersburg	Wrangell
All Resources	666.9	460.3
Fish	300.2	205.6
Salmon	150.8	84.7
Other Finfish	149.4	120.9
Game	209.4	104.7
Deer	146.3	57.3
Bear	4.7	8.3
Marine Mammals	0.0	19.6
Birds	18.4	6.3
Marine Invertebrates	114.9	115.2
Plants and Berries	24.0	8.9

Source: Alaska Department of Fish and Game, 1992a

### Community Subsistence Profiles

#### *Petersburg*

Petersburg is situated on the northwest shore of Mitkof Island at the north end of Wrangell Narrows, approximately ten miles from the Crystal Creek Project Area. Per capita income for Petersburg residents in 1987 was reported as \$12,602 (Kruse and Frazier, 1988). Approximately 14 percent of the population are Native Americans (Alaska Department of Fish and Game, 1989). Prior to white settlement, the Petersburg area was used for seasonal fishing camps by Native Americans. Founded by Norwegian Peter Buschmann in 1899, Petersburg was incorporated in 1906. More Norwegians followed and created a Scandinavian-style community. Petersburg grew around a cannery, and the site quickly became a center for fishing, fish processing, and transportation. Except for a slight decline in the 1950s, a continual growth in population has occurred. The 1990 census population of Petersburg was 3,207 people.

Petersburg is highly dependent on seafood harvesting and processing. A number of fish, shrimp, and crab canneries have operated in Petersburg and Scow Bay over the years. Petersburg is home port to the largest salmon purse seining fleet in Southeast Alaska. Halibut has also been central to the local fishing industry because it provided regular employment through the winter months. Approximately 37 percent of the households fished commercially in 1987 and 12 percent of all fish used by households was retained from commercial catches (Alaska Department of Fish and Game, 1992a).



Government employment in Petersburg accounted for 35 percent of the wage income in 1986. The government sector has been declining through the late 1980s and early 1990s. Other economic sectors include retail trade, construction, timber, and tourism. Large scale logging was introduced to the area in the 1960s (Alaska Department of Fish and Game, 1992a).

The subsistence resources most commonly used by Petersburg residents are coho and chinook salmon, halibut, and deer. Crab, shrimp, berries, and wood are also important. Subsistence harvest provides just over 30 percent of the meat and fish for Petersburg residents (Kruse and Muth, 1990).

Harvest of land mammals by Petersburg residents consists primarily of deer, which are accessed mostly by boat and foot. Where logging roads are present, hunters often use all-terrain vehicles or hike on roads (Alaska Department of Fish and Game, 1992a).

From 1987-95, residents of Petersburg gathered about 4.5% of their total deer harvest within the project area (Alaska Department of Fish and Game 1996). This hunting resulted in an estimated harvest of 49 deer/year average in WAA 1605 during those years, nearly all by Petersburg residents. TRUCS data indicate that Petersburg residents hunt extensively for deer throughout the project area, except for the very headwaters of Delta Creek, Crystal Creek, and the Muddy River.

An average of about two goats have been taken in recent years in WAA 1605, with 74 percent of the reported harvest by Petersburg residents (Table 3-28). An average of six goats (range 3-14) have been taken each year since 1988 in nearby WAA 1706 which includes the Horn Cliffs goat population (Crain 1996) with 71 percent of these hunters from Petersburg. Currently, Petersburg hunters access the Horn Cliffs area from Frederick Sound, but concern was expressed that bridging across the Muddy River and roading in Crystal Creek would provide roaded access to the Horn Cliffs goat herd.

Some fur trapping occurs within the study, mostly for marten (Table 3-28). Petersburg residents account for 100% of the reported harvest of marten, otter, and wolves since 1987. The black bear harvest is low, averaging only about one bear a year, with 100% of the reported subsistence harvest by Petersburg residents.

Subsistence fish and marine invertebrate use areas were derived largely from the TRUCS maps. The only reported subsistence marine invertebrate harvest areas within the project area were by residents of Petersburg. These areas include the tidal environments from Icy Cove to the Point Agassiz Peninsula and along the north shoreline of the Point Agassiz Peninsula between Wood Point and the mouth of Bock Bight, plus the waters of Thomas Bay north of Ruth Island. These areas are mostly used to harvest shrimp and crab. A significant commercial dungeness crab fishery also occurs in the marine waters near the mouth of the Patterson River, and it is likely that some subsistence crab harvest occurs here as well. Petersburg residents report using the marine waters of Frederick Sound and Thomas Bay extensively from subsistence salmon and nonsalmon finfish harvesting.

### *Wrangell*

Wrangell is located approximately 33 air-miles south of Petersburg on the northern tip of Wrangell Island. It is approximately 40 miles from the Crystal Creek Project Area. The 1990 population was reported at 2,479 people. Approximately 38 percent of the population is Native Alaskan. Per capita income of Wrangell residents in 1987 was reported at \$11,989.



Wrangell began as an important Tlingit village primarily because of its proximity to the Stikine River. Wrangell Stikine Kwan clans held and fiercely defended a monopoly of trading rights along the Stikine River, which served as an important early trade route into the Canadian interior. The flags of three nations (England, Russia, and the United States) have flown over Wrangell. Wrangell became a supply center for gold miners and prospectors during a gold rush in 1862 and in the Klondike rush of the 1890s. Over the years several fish, crab, and shrimp canneries have operated near Wrangell (Alaska Department of Fish and Game, 1992a).

Today, timber, fishing, and fish processing dominate Wrangell's economy. Approximately 19 percent of Wrangell households fished commercially in 1987. Commercial fishing contributes significantly to the subsistence fish harvest because commercial fishermen generally have the skills and equipment to be successful in subsistence harvests. Also, deer are often hunted in areas remote from Wrangell and not accessible by small boats or skiffs. In Wrangell, approximately 16 percent of all fish used by households in 1987 was retained from commercial catches (Alaska Department of Fish and Game, 1992a).

Timber eventually surpassed fishing in Wrangell's economic history, and by 1987 government was the third major employer after timber and fishing (Alaska Department of Fish and Game, 1992a). Wrangell has a full-time U.S. customs agent to handle international trade. Tourism has been a growing economic sector in recent years. More than 18,000 tourists visited Wrangell in 1987.

No deer harvest was reported by Wrangell residents within the project area from 1987-95 (Alaska Department of Fish and Game 1996); however, TRUCS data indicate that residents of Wrangell have reported hunting for deer in the project area. No goats have been reported harvested by Wrangell residents from 1989-95 within the project area or within the Horn Cliffs area to the immediate south of the project area. The area would not be considered an important deer or goat hunting area for residents of this community. No furbearer or black bear harvest has been reported by Wrangell residents within the project area in recent years (Alaska Department of Fish and Game 1996).

The TRUCS data indicate that some harvest of marine mammals by Wrangell residents has been reported to occur near the McDonald Islands, but none has been reported within Thomas Bay.

Subsistence fish and marine invertebrate use areas were derived largely from the TRUCS maps. Wrangell residents report extensive use of the project area for harvesting salmon and other fish. Areas reportedly used by Wrangell residents include Thomas Bay, Frederick Sound offshore of the Muddy River and Brown Cove, the Patterson River drainage, the lower two miles of the Muddy River, Ruth Island, Bock Bight Peninsula, and various inland locations near Point Agassiz, Brown Cove, and the Thomas Bay log transfer facility.

## Environmental Consequences

### *Abundance and Distribution of Deer*

Deer are one of the most important subsistence resources for communities in Southeast Alaska (Alaska Department of Fish and Game 1989; Kruse and Muth 1990). The Crystal Creek Project Area provides about 5% of the deer for Petersburg residents.

This evaluation of deer for the Crystal Creek Timber Harvest DEIS is based on a comparison of supply and demand. The habitat capability model for deer, developed as part of the Forest Plan and as applied in this analysis, provides an estimate of the potential number of deer available for harvest within the project area over time. This equates to a supply available for subsistence use. The level of deer harvest during a 5-month, 2-buck bag limit, provides an estimate of the demand for deer within the project area. If the demand for deer exceeds the supply, then a significant possibility of a restriction exists. The Alaska Department of Fish and Game assumes that approximately ten percent of the deer population can be harvested on a sustained basis if the population is equal to the habitat capability. Thus, the minimum number of deer needed in an area is approximately ten times the subsistence hunter demand for deer, otherwise a restriction on subsistence hunting may ensue.

It is assumed that communities that currently use the project area for subsistence resources will continue to do so in the foreseeable future, if the area remains open for deer hunting. An estimated 49 deer have been harvested annually in WAA 1605 in recent years. Two percent of the total reported harvest in WAA 1605 was by residents of Haines, who do not have a subsistence priority in this portion of the mainland. No other community reported harvesting deer within WAA 1605 from 1987-1995 (Alaska Department of Fish and Game 1996).

Subsistence demand for deer was estimated by using the average harvest from 1987-1995 for WAA 1605 and assuming a 15% increase per decade, following human population projections given in the Forest Plan. By 2040, the subsistence demand is expected to be 94 deer, which, assuming a 10% harvest rate, would require a deer population of 940 deer. All alternatives are estimated to provide sufficient habitat to maintain a deer population in excess of 1275 deer by 2040. The amount of old-growth forest harvested by the alternatives is not expected to result in restrictions to sport or subsistence harvests of deer in the foreseeable future. Based on the habitat modeling analysis and the levels of subsistence deer harvest reported by Alaska Department of Fish and Game, this evaluation concludes that a significant restriction on the subsistence use of deer is not likely under any of the alternatives (Table 3-24).

### *Abundance and Distribution of Mountain Goats*

The Crystal Creek Project Area and surrounding area is an important goat hunting area for residents of Petersburg. Slightly over 70% of the harvest has been by residents of Petersburg and the remainder has been by non-subsistence hunters. This evaluation of goats for the Crystal Creek Timber Harvest DEIS is based on a comparison of the current level of harvest and to estimated changes in goat habitat and access to goat hunting areas.



Current harvests of mountain goats within the project area are low, despite the presence of high goat populations and extensive goat habitat. A yearly average of about two goats have been taken recently in the project area (Table 3-28). All action alternatives are expected to reduce goat carrying capacity by less than two goats. Some increase in goat harvest may occur due to improved access above Ess Lake and into the Upper Muddy River drainage. These goat populations are large and virtually unhunted and the potential increase in goat harvest is not expected to be detrimental to the goat populations or to require restrictions in hunting seasons in any of the action alternatives.

Of greater concern is the Horn Cliffs goat population adjacent to the south side of the project area. In the past, there has been concern expressed that this population is being excessively hunted and, in the 1980's, goat hunting was briefly restricted to males only to reduce the potential for overharvest. A concern was expressed that roading in Crystal Creek drainage would result in harvest detrimental to the goat population.

Alternatives 1 and 5 would not construct any new roads into the Crystal Creek drainage. A motorized closure is proposed at the bridge crossing of the Muddy River into the Crystal Creek drainage in Alternatives 2, 3, and 4, officially closing the Crystal Creek drainage to motorized access by the public. A major reason for this proposed closure is to limit access to the Horn Cliffs goat population. In addition, logging roads would be closed after timber harvest, further restricting access. The shortest distance between the alpine habitat of Horn Mountains and present and proposed roads (including roads that would be closed after timber harvest) is 1.75 miles in Alternatives 1 and 5, 0.6 miles in Alternatives 2 and 3, and 0.15 miles in Alternative 4. The proposed road closure to motorized access should keep goat harvest levels of the Horn Cliffs population at a sustainable level. However, the possibility that overharvest of goats will occur under Alternatives 2, 3, and 4 cannot be entirely ruled out. Goat harvests are monitored yearly by the Alaska Department of Fish and Game, and further road access or harvest restrictions may be necessary. Harvest restriction on goat hunters, although not considered likely in Alternatives 2, 3, and 4, would probably first affect non-subsistence hunters due to the ANILCA rural subsistence preference, but could conceivably restrict subsistence hunters as well.

#### *Abundance and Distribution of Furbearers*

Some fur trapping occurs within the project area, primarily for marten (Table 3-28). Petersburg residents account for 100% of the reported harvest of otter, marten, and wolves since 1987. Harvest of furbearers occurs both along the shoreline by people using boats for access, as well as along the existing road system. Seven percent of Petersburg households harvest furbearers (Kruse and Frazier, 1988).

Marten were chosen as a management indicator species for the analysis. The estimated marten habitat capability within the project area in 1954 was 116 animals. The estimated habitat capability at present is about 99 animals, a 14% reduction. The estimated reduction of marten habitat capability for the action alternatives is one to two animals (about a 2% reduction). Significant subsistence restrictions on marten are not expected as a result of any action alternatives proposed. Overall, the miles of roads open to motorized public access after the timber harvest is not expected to change significantly or to affect marten populations negatively.



### *Abundance and Distribution of Black Bear*

An average of about one black bear is killed each year within the project area (Table 3-28). Historically, 62 percent of the reported harvest was by Petersburg residents, the remainder was by out-of-state hunters. Field observations indicate that black bears are common and well-distributed within the sale area. The habitat potential of the project area exceeds the ability to meet the current level of harvest and none of the alternatives is expected to result in any restrictions to subsistence harvest of black bears.

### *Access to Wildlife*

The primary modes of access for harvesting wildlife include boats, foot travel, cars, all-terrain vehicles, and bicycles. The existing logging roads have traditionally been used extensively for hunting.

Some people want roads maintained for access. Several people and agencies expressed concern that roading in Crystal Creek could result in the overharvest of the Horn Cliffs goat population.

Access by boat and foot is not expected to be restricted by any of the action alternatives. Access to areas along the beach fringe will not change. The IDT has developed proposed road management objectives that attempt to limit motorized access to about the current level. A posted motorized closure to public access would be established at the potential bridge crossing of the Muddy River into Crystal Creek in Alternatives 2, 3, and 4. All newly constructed roads would be closed after the sale in all action alternatives. Alternative 5 would limit the amount of new road construction and concentrate timber harvest around the existing roads.

In all action alternatives, there would be a short-term increase in motorized access and a long-term increase in foot access to the area surrounding Ess Lake. All action alternatives would result in some long-term increase in motorized access in the upper Muddy River drainage as a result of road reconstruction. Alternatives 2, 3, and 4 would result in long-term increases in foot access into the Crystal Creek drainage as long as the bridge crossing of the Muddy River remains. None of these increases in access are expected to significantly restrict or otherwise impact subsistence use of the project area, except for the low possibility of excessive pressure on the Horn Cliffs goat population.

### *Competition for Wildlife*

Competition is closely linked to access, and both can be interpreted as being either favorable or adverse to subsistence gathering. Opening an area up by increasing access is a favorable development for subsistence users who often depend on a road to transport their animals out of the field. On the other hand, that same increased access represents increased competition for subsistence resources, which is interpreted as an adverse impact. Increased access can be considered favorable for subsistence users but may have a long term adverse impact for users if overharvesting occurs.

No logging roads are proposed on Ruth Island, Bock Bight Peninsula, most of Point Agassiz Peninsula, and in the area from Muddy River to Horn Cliffs facing Frederick Sound. In the remaining portion of the project area, use of roads for access is the common mode of transportation by hunters. Some increase in hunters would probably occur in all the action alternatives due to improved access. Much of the increase in hunting would be by other local subsistence hunters.

A temporary logging camp may occur at Thomas Bay that could house about 25 workers. These workers could be local subsistence users or non-subsistence hunters. Subsistence users would have the ANILCA preference over non-subsistence users if game populations were reduced to levels that required restrictions on harvests. No such reductions in game populations or harvest restrictions are expected in any of the alternatives due to increased competition, except for a low possibility of overhunting the Horn Cliffs goat population in Alternatives 2, 3, and 4.

#### *Subsistence Fish and Shellfish Effects and Evaluation*

Fish and shellfish comprise a very significant portion of the diet of most residents in Southeast Alaska. Over 60 percent of the subsistence resources gathered by Petersburg residents are fish and shellfish; the comparable figure for Wrangell is almost 70 percent.

Subsistence fish and marine invertebrate use areas were derived largely from the TRUCS maps. The only reported subsistence marine invertebrate harvest areas within the project area were by residents of Petersburg. Subsistence use areas include the tidal areas from Icy Cove north to the Point Agassiz Peninsula and along the north shoreline of the Point Agassiz Peninsula between Wood Point and the mouth of Bock Bight, plus the waters of Thomas Bay north of Ruth Island. These areas are probably mostly used to harvest shrimp and crab. A significant commercial dungeness crab fishery also occurs in the waters near the mouth of the Patterson River, and it is likely that some subsistence crab harvest occurs here as well.

Petersburg residents report using the marine waters of Frederick Sound and Thomas Bay extensively for subsistence salmon and other fish harvesting. Wrangell residents report extensive use of the project area for harvesting salmon and other fish. Areas reportedly used by Wrangell residents include Thomas Bay, Frederick Sound offshore of the Muddy River and Brown Cove, the Patterson River drainage, the lower two miles of the Muddy River, Ruth Island, Bock Bight Peninsula, and various inland locations near Point Agassiz, Brown Cove, and the Thomas Bay log dump. Edna Bay residents have also reported using the waters of Frederick Sound offshore of the Point Agassiz Peninsula for salmon and other fish harvesting.

#### *Abundance and Distribution of Fish and Shellfish*

Figure 3-13, page 3-93, shows the general location of the fish habitat in the project area. Alternative 5 would present the fewest impacts to streams and fish because it has the fewest number of road crossings. The risk of impact to fish populations due to timber harvest would be minimal because of TTRA stream buffers, Forest Plan riparian standards and guidelines, and road construction BMPs.

There are no expected measurable effects on shellfish populations for all action alternatives. The Thomas Bay LTF would present the greatest potential for adverse impacts to shellfish. A dive conducted in 1997 found no bark accumulation at the LTF, 20 years after most logging occurred.

#### *Access to Fish and Shellfish*

Roading associated with timber harvest will increase access to streams but not shorelines in the project area. Because timber will be harvested on uplands and away from shorelines, access to historic saltwater fish and shellfish areas should not be affected in the near or foreseeable future.



### *Competition for Fish and Shellfish*

Competition for fish is not expected to increase due to the Crystal Creek timber harvest. Fishing and shellfish gathering occurs primarily from boats and on beaches, negating any access impacts due to timber harvest or road building.

### *Personal Use Wood and Firewood Effects and Evaluation*

Each Alaska resident is entitled to 10,000 board feet of sawtimber and 25 cords of firewood every year. Current subsistence wood use in the project area is estimated at 10-15,000 board feet of sawtimber and 30 cords of firewood a year for the project area by all users. Harvesting timber would have both a negative and positive effect on subsistence wood use. One positive effect would be the increased access to forested areas with the construction of new roads. Firewood may also be made available at the landings. However, this increased access would be only temporary since all new roads are proposed for closure after timber harvest is complete. Some currently accessible timber is within the Point Agassiz Old-Growth Reserve. Alternative 3 would close considerably more area to personal use timber harvest, because of the U. S. Fish and Wildlife Service recommended expansion of the Old Growth Reserve. Current preference for personal-use sawtimber is large spruce trees, which would not be compatible with the objectives of the Old-growth Habitat land use designation.

### *Food Plants Effects and Evaluation*

Other items used for subsistence include plants such as kelp and a variety of berries. TRUCS data indicate that other foods and plants make up 3.6 percent of the per capita harvest of the household subsistence harvests in Petersburg. Roads and clearcuts within the project area are used to harvest some plants such as berries. Most traditional gathering of other plants and foods occurs near beach and estuarine areas. Clearcutting with reserves would probably improve the abundance of berries in the short term, because many of these plant species thrive on the open exposed slopes (Alaback 1982). Based on a projected increase of berries and the locations of the potential activities, none of the alternatives is expected to negatively affect subsistence plant gathering for food. Reasonably foreseeable effects of the action alternatives on the abundance and distribution of food plants would be minimal and favorable.

### *Marine Mammals Effects and Evaluation*

The Marine Mammal Protection Act of 1972 prohibits the taking of marine mammals by anyone other than Alaska Natives. The Act allows Alaska Natives to take marine mammals for subsistence or to create authentic native handicrafts or clothing as long as it is not accomplished in a wasteful manner.

The TRUCS data indicates that some harvest of marine mammals by Wrangell residents has been reported to occur near the McDonald Islands, but none has been reported within Thomas Bay. The McDonald Islands will not be affected by any of the alternatives. Currently, there is no evidence to suggest that timber harvest and related development activities have any impact on marine mammals. No significant restriction to the subsistence use of marine mammals is expected under any alternative.



### *Cumulative Effects*

The subsistence analysis evaluates whether the project, in combination with other past, present, and reasonably foreseeable future actions, may significantly restrict subsistence uses. Although the precise location of future projects is not clearly known, some conclusions can be reasonably made about future impacts.

Action on other than Federal lands in the project area may affect subsistence resources harvested by local residents. Most of the State land has been logged or otherwise developed and the harvest impacts on state lands have been accounted for in the wildlife models displayed in the Biodiversity section of Chapter 3. Some activities, such as opening roads and tree thinning are currently planned on State land at Thomas Bay by the Alaska Department of Fish and Game in order to benefit moose and deer hunters. The cumulative effects of past activities on non-Forest Service lands are not expected to significantly exceed impacts to subsistence use of wildlife beyond that shown in this analysis.

The cumulative effects on fish habitat are primarily associated with past logging. Application of Forest Plan riparian standards and guidelines will minimize future impacts to fish habitat.

The Forest Plan addressed the long-term consequences on subsistence and concluded that a significant restriction on subsistence use of deer and other land mammals may result due to the potential effects of project-level decisions. The project analysis in combination with past timber harvest indicates that significant restrictions on subsistence use will not occur as a result of any of the action alternatives. There is a remote possibility that roading in the Crystal Creek drainage in Alternatives 2, 3, and 4 could cause overhunting of the Horn Cliffs goat population. However, mitigation measures will prevent this possibility. Roads are proposed to be closed to motorized vehicles in all action alternatives and monitoring of the goat harvest should be sufficient to prevent overhunting. Additional road access restrictions or restrictions to non-subsistence goat hunters could be implemented to further protect subsistence goat hunting if monitoring indicates.

Several measures are designed to maintain subsistence wildlife species over time. Some measures set aside habitat in 1000-foot beach and estuary buffers, Old Growth Reserves, and permanently sustain equal mixtures of older-forest habitat and young growth vegetation. Other measures include limiting harvest above 1500 foot elevation in goat habitat, scheduling harvest throughout the rotation, road closures, single-tree selection harvest, leaving reserve trees within clearcuts, and thinning second growth to prolong understory vegetation.

The Federal Subsistence Board has the authority to regulate subsistence and non-subsistence use of resources in the Tongass National Forest when those resources are approaching scarcity. This type of action, as prescribed by ANILCA Section 804, could be used to ensure the availability of adequate subsistence resources needed by the rural communities using the project area if necessary.

### *ANILCA Compliance*

The actions proposed in this document have been examined to determine whether they are in compliance with the Alaska National Interest Lands Conservation Act (ANILCA) Section 810. Standards used for the review include (1) the National Forest Management Act of 1976 and its implementing regulations; (2) the Alaska National Interest Lands Conservation Act (1980); (3) the Alaska Regional Guide (1983); (4) the Tongass Land and Resource Management Plan; (5) the Tongass Timber Reform Act (1990); (6) the Alaska State Forest Practices Act; (7) the Alaska Coastal Management Program; (8) Multiple Use Sustained Yield Act (1960); (9) USDA Forest Service Subsistence Management and Use Handbook (FSH 2609.25).

### *Necessary and Consistent with Sound Management of Public Lands*

The ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make timber available for harvest from the Tongass National Forest. The Forest Plan makes the determination of which uses are suitable for various parcels of land within the Tongass National Forest. The Forest Plan has determined that parts of the project area should be managed for varying levels of timber production.

The alternatives presented here encompass four action alternatives that would help achieve multiple use management objectives in the Forest Plan. All of the action alternatives involve some potential impact to subsistence uses. Based entirely on the guidance provided by the documents listed above, these action alternatives are considered necessary and consistent with sound management of public lands.

### *Amount of Land Necessary to Accomplish the Purpose of the Proposed Action*

Much of the Tongass National Forest is used by one or more rural communities for subsistence purposes. It is not possible to lessen timber harvest in one area, and concentrate it in another without impacting one or more rural communities important subsistence use areas.

The Crystal Creek Project Area is about 64,000 acres, not including saltwater. The acreage for proposed harvest units range from about 1,014 in Alternative 2 to 1,799 acres in Alternative 4. In many of the harvest units, only selected trees will be cut or only small openings totaling 10 to 40 percent of the entire unit will be logged. The number of actual acres opened by logging ranges from only 475 acres in Alternative 5 which emphasizes logging by single tree selection and in higher-volume forests to 753 acres in Alternative 3 which emphasizes avoiding harvesting in higher-volume sites.

The extent and location of the subsistence use areas in the Crystal Creek Project Area makes it impossible to completely avoiding these areas during timber harvest. The pattern of subsistence hunting within the area is closely associated with existing roads and logged areas. The large areas of critical deer habitat and important hunting areas, such as Ruth Island, Bock Bight, Point Agassiz Peninsula and the area facing Frederick Sound from the Muddy River to Horn Cliffs were largely avoided in all alternatives. Nearly all the highest quality goat winter habitat was likewise avoided in all of the action alternatives. Road access restrictions are proposed to keep future motorized access by hunters comparable to the current situation.



### *Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources*

Chapter 2 and Appendix B describe mitigation measures that will be implemented as part of each alternative. Most of the mitigation measures are designed to maintain fish and wildlife habitat productivity, while still harvesting timber to meet the purpose and need.

One of the most significant subsistence resources in the analysis area is salmon. Fish habitat is protected in each alternative through the application of the Forest Plan standards and guidelines. In addition to protecting fish habitat, estuarine and riparian buffers also protect habitat important to other species such as deer, black bear, and furbearers.

Alternative 3, which proposes to double the size of the small OGR at Point Agassiz, provides greater long-term habitat protection to a deer and furbearer subsistence use area. Alternative 5 would not increase roads in Crystal Creek and foot access to the Horn Cliffs goat population. Road closures in the Crystal Creek drainage are designed to minimize impacts to subsistence species in Alternatives 2, 3, and 4.

### *Conclusions and Findings*

The potential foreseeable effects from the action alternatives in this project are not expected to result in a significant restriction of subsistence uses of deer, black bear, furbearers, marine mammals, waterfowl, salmon, other finfish, shellfish, or other foods.

No increased impacts on subsistence goat hunting are likely to occur, except that the possibility exists that increased road access in Alternatives 2, 3, and 4 could potentially result in overharvest of the Horn Cliffs goat population. This possibility is minimized because of the proposed road closure to motorized public access at the Muddy River crossing. If one of these alternatives were selected, goat harvest in the Horn Cliffs would be monitored to see if further road management restrictions were warranted. Alternative 5 would not substantially change access into Crystal Creek from the present condition.

The findings conclude that Alternatives 1 and 5 will not negatively affect subsistence harvest of goats with the project area or in the adjoining Horn Cliffs area. Alternatives 2, 3, and 4 should not negatively affect goat subsistence use within the project area. The proposed motorized closure should be sufficient to protect the future opportunities to harvest subsistence goats in Crystal Creek and the Horn Cliffs area in Alternatives 2, 3, and 4. However, monitoring of the Horn Cliffs goat harvest will be necessary to determine if overharvesting is occurring and if further road access restrictions and/or harvest restrictions on non-subsistence hunters are necessary to maintain subsistence hunting. The possibility that additional roading in Crystal Creek will result in restrictions to subsistence goat hunting in the Horn Cliffs area is unlikely in Alternatives 2, 3, and 4, but cannot entirely be dismissed.



# Legend













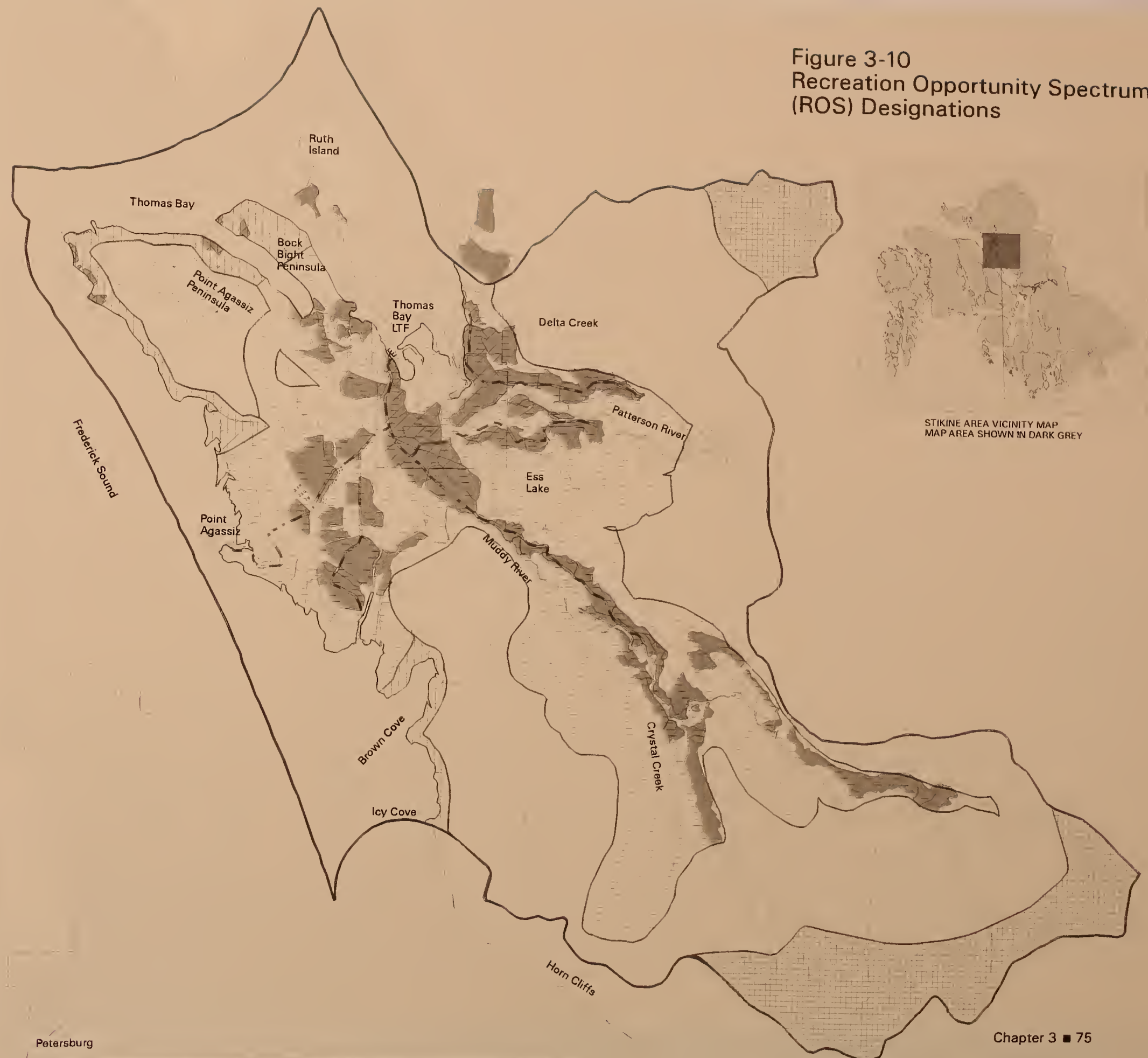
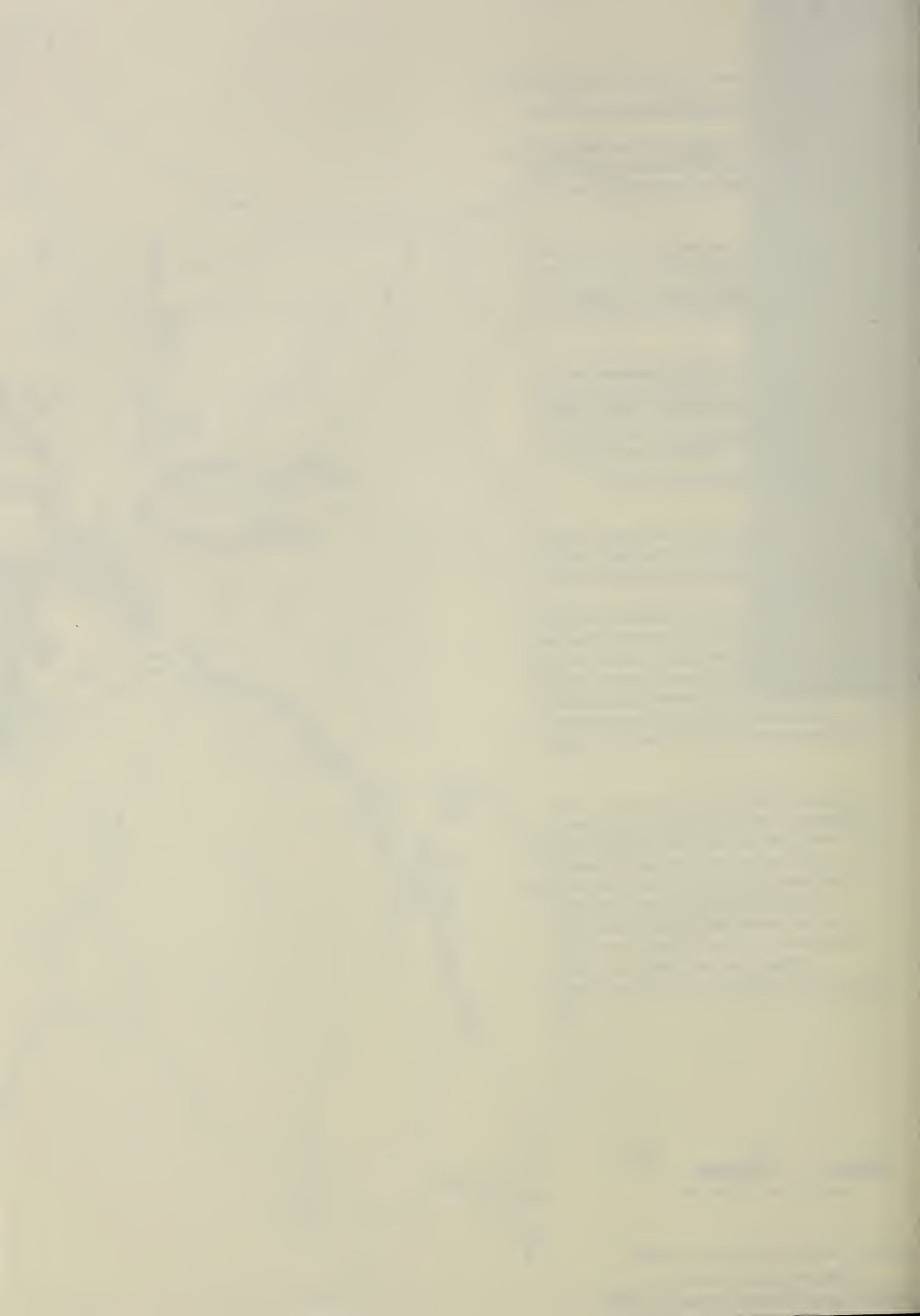
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Shoreline, Lakes, Class I/II Streams
-  Existing Managed Stands
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Primitive
-  Semi-Primitive Motorized
-  Semi-Primitive Nonmotorized
-  Roaded Modified
-  Log Transfer Facility (LTF)

Figure 3-10  
Recreation Opportunity Spectrum  
(ROS) Designations



0 7920 15840  
Scale is 1 inch = 7920 feet





## **Issue 4 - Recreation**

### **Overall Recreation Setting**

The Thomas Bay area is a very popular recreation area with a wide diversity of recreation activities available. The close proximity to Petersburg makes it an easy day or weekend trip from town. Within the Crystal Creek Project Area, people use the Patterson River and Glacier for hunting, rafting, and hiking. One outfitter/guide is currently permitted for raft trips down the River. Although there is not currently a developed trail along the Patterson River, it is a relatively easy hike along the south side, starting on an old logging road and then through the woods to an open area directly across from the Patterson Glacier. It is also possible to hike or drive an ATV on logging roads on the north side and hike through the woods to the Patterson River.

Many hunters from Petersburg establish hunting camps along the Patterson and Muddy Rivers during the hunting season. Five Special Use Permits were issued in 1996 for moose hunting tent platforms within the project area.

Mountain biking along the existing logging roads is a popular day trip. Approximately, 17 miles of road from Point Agassiz can be accessed by boat.

Attractions within Thomas Bay but outside the Crystal Creek Project Area include three Forest Service cabins (Spurt Cove, Cascade Creek, and Swan Lake), the Cascade Creek Trail, and Falls Lake Shelter. Undeveloped attractions include Baird Glacier for sightseeing and hiking, and salmon and halibut fishing. There is also a spectacular waterfall a half mile up from saltwater on Cascade Creek. Some small cruise ships come into Thomas Bay to drop off sightseers at Cascade Creek.

### **Historic Recreation Trails**

Two historic trails exist within the analysis area that are no longer maintained or officially included in the Forest Service trail system. One trail originated in Brown Cove, headed towards Brown Cove Lake, and then followed the Muddy River to near the base of Muddy Glacier. The trail was constructed in the late 1940's and marked with tree blazes for about 12 miles. Many of the tree blazes, some cut logs, and trail tread can be seen today along with the remnants of a shelter that was built when the trail was constructed.

The other historic trail in the analysis area starts at the mouth of Delta Creek just north of where the Patterson River empties into saltwater. The four-mile trail follows Delta Creek up to Ruth Lake.

### **Recreation Opportunities**

To describe, identify, and quantify recreation settings, the Forest Service uses the Recreation Opportunity Spectrum (ROS). The ROS categorizes areas by their activities, remoteness, access, and experiences in a spectrum of classes from Primitive to Urban (see Glossary). The Crystal Creek Project Area includes four of the seven classes in the Recreation Opportunity Spectrum: Primitive, Roaded Modified, Semi-primitive Motorized, and Semi-primitive Nonmotorized (Figure 3-10 and Table 3-30). The Primitive area includes an area east of Ruth Lake and another area northeast of Horn Cliffs. The Roaded Modified area includes the previously harvested stands and road corridors. The Semi-primitive Motorized area includes most of the shoreline where it is not Roaded Modified. The Semi-primitive Nonmotorized class occupies the rest of the analysis area.



**Table 3-30.**  
**Recreation Opportunity Spectrum Class in the Crystal Creek Project Area**

ROS Class	Acres	Percent
Primitive (P)	6,810	11
Semi-Primitive Non-Motorized (SPNM)	35,942	57
Semi-Primitive Motorized (SPM)	2,169	4
Roaded Modified (RM)	17,819	28

In all alternatives, the number of acres of Primitive and Semi-primitive Motorized remain the same (Table 3-31). In the action alternatives, the number of acres in the Semi-primitive Nonmotorized class decreases and the Roaded Modified increases. The amount of change is very similar in Alternatives 2, 3, and 4. The changes in Alternative 5 are substantially less since much of the proposed timber harvest in this alternative occurs in previously harvested areas that are already in the Roaded Modified class. Although Alternative 5 has the least change to ROS class, there would be greater impacts to recreation since much of the proposed harvest takes place off the Point Agassiz road system.

**Table 3-31.**  
**Change in Recreation Opportunity Classes by Alternative**

ROS Class	Alt. 1 Acres	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
Primitive	6,810	6,810	6,810	6,810	6,810
Semi-Primitive Non-Motorized	35,942	30,807	31,254	30,771	34,395
Semi-Primitive Motorized	2,169	2,169	2,169	2,169	2,169
Roaded Modified	17,819	22,954	22,507	22,990	19,366

### Recreation Places

Recreation Places are areas of land and water with characteristics that provide opportunities for recreation activities. There are four Recreation Places within the project area; the largest is the roaded area along the Muddy and Patterson Rivers. Activities include hunting, mountain biking, and sightseeing. A second Recreation Place extends up the Patterson River beyond the roaded area. Activities include moose hunting, river rafting, hiking, and sightseeing. The third Recreation Place includes the beach and shoreline of Brown Cove and Icy Cove. Activities include beachcombing, picnicking, camping, and boating. The fourth Recreation Place includes the beach and shoreline near Wood Point on the northwest corner of the Point Agassiz Peninsula. The beach is used for beachcombing, picnicking, and tent camping, especially by kayakers.

The Patterson River, Wood Point, and Brown Cove/Icy Cove Recreation Places will not be greatly affected by any of the alternatives. No roads or units have been proposed within these areas. Possibly during actual harvest, distant sounds could be heard from the logging operations.

The fourth Recreation Place includes the roaded area around Point Agassiz, Muddy River, and the Patterson River. The activities associated with this Recreation Place often use the road system, such as mountain biking, hunting, sightseeing. Recreationists may expect to see more people because of road construction and reconstruction and reconstruction of the log transfer facility. During timber harvest, the sights and sounds of logging and increased road use could temporarily disrupt some activities.

### **Proposed Recreation Shelter and Access Trail to Ess Lake**

An area on the northeast end of Ess Lake is proposed for a three-sided shelter/picnic area in Alternatives 2 and 5 (Figures 2-2 and 2-5). An approximately quarter-mile long access trail would be constructed from the existing road system. The trail will need gravel or boardwalk surfacing to minimize muskeg damage (Appendix B-192 and 193).

### **Potential Patterson River Trails**

Patterson Glacier can be seen by hiking along the south side of the Patterson River. Currently, after leaving the existing road, hikers must find their own way through the woods while paralleling the river. There is potential to develop a trail along the south side of the river so hikers could follow a trail instead of hiking cross-country.

The road on the north side of the Patterson River has been kept open by hikers and moose hunters. To access the Patterson River, about a mile of trail would need to be constructed at the end of the existing road.

Scoping indicated some disagreement on trail proposals. Some moose hunters are strongly opposed to increased trail access because it would concentrate hunters and because of safety concerns. Other members of the public favored trail access. No trails are being recommended for development at this time.

### **Inventoried Roadless Areas**

All areas within the Tongass National Forest that are in an unroaded and essentially undeveloped condition were inventoried by the Forest Service and evaluated for Wilderness potential (refer to Forest Plan Appendix C). Forest Plan direction allows roading and timber harvest within inventoried Roadless Areas if compatible with land use designation. The Spires Roadless Area of 538,670 acres overlaps the Crystal Creek Project Area (Figure 3-11). About 92% of this roadless area is outside of the Crystal Creek Project Area.

All the action alternatives would slightly decrease the size of the inventoried Spires Roadless Area. Of the action alternatives, Alternative 3 would have the most effect and Alternative 5 would have the least. The overall setting and character of the Spires Roadless Area would remain unchanged in all of the action alternatives.

### **3-11 Spires Roadless Area**



# Legend












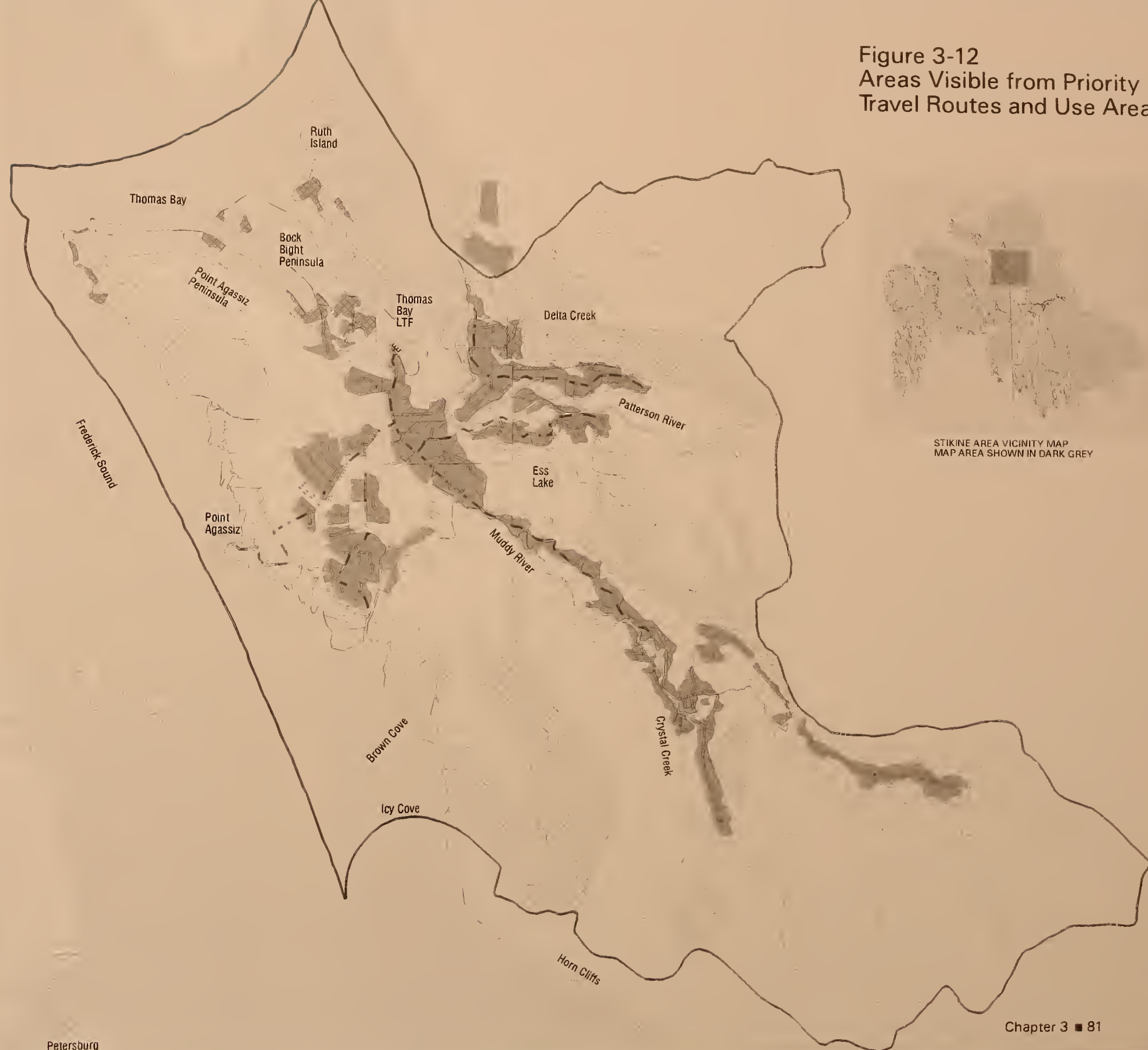
-  Seen Area
-  Crystal Creek Project Area Boundary
-  Existing System Roads
-  Existing Closed Roads
-  Shoreline, Lakes, Class I/II Streams
-  500-ft. Contours
-  Existing Managed Stands
-  Saltwater
-  Wilderness
-  Non-National Forest Lands
-  Log Transfer Facility (LTF)

Figure 3-12  
Areas Visible from Priority  
Travel Routes and Use Areas



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY

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Scale is 1 inch = 7920 feet

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Petersburg



## **Recreation Access**

All of the action alternatives include some road construction (refer to Chapter 2 for maps and tables of road additions by alternative Figure 2-1 to 2-5) and the reconstruction of Road 6256 paralleling the Muddy River. These roads add to the existing road system and provide additional public access into the Crystal Creek Project Area.

Alternative 1 would have no road construction or reconstruction. Alternative 1 would continue to keep hunters more concentrated than the action alternatives. Alternatives 2 to 5 provide more opportunities to disperse moose hunters. All the action alternatives include new road construction in the Ess Lake area. Alternatives 2, 3, and 4, include new road construction in the Crystal Creek drainage. Alternative 3 includes new road construction on the upper Muddy River area. Alternatives 2, 4, and 5 would build new road on the Agassiz Peninsula; however, the amount of road built in Alternative 5 would be minimal.

All new roads are proposed to be closed after timber harvest, but foot traffic may still be possible. Such increased access would accommodate recreational uses, such as hiking, mountain biking, hunting, and access to backcountry areas. The road into the Crystal Creek drainage would be closed to motorized access by the general public during and following timber harvest activities. Off-road vehicle use on the closed roads in the rest of the project area would be acceptable.

## **Wild and Scenic Rivers**

During the Tongass Land Management revision process, several hundred rivers on the Tongass National Forest were evaluated for possible inclusion in the National Wild and Scenic Rivers system. The Patterson River was the only river in the project area found eligible for Wild and Scenic River status. The eligibility of the Patterson River was maintained in all alternatives during the Forest Plan revision process. The Forest Plan did not recommend the Patterson River for inclusion in the Wild and Scenic River system. Seven rivers were recommended to represent the Coast Range Geographic Province.

## **Scenery**

### **Visual Priority Travel Routes and Use Areas**

Visual Priority Travel Routes and Use Areas identify viewing locations from which scenic impacts are assessed. Areas visible from Visual Priority Travel Routes and Use Areas are called "seen." "Seldom-seen" areas are not viewed from priority travel routes and use areas. "Viewsheds" represent the entire visible or seen area from any position along a priority travel route or use area.

The Visual Priority Travel Routes and Use Areas from which the project area can be viewed are Frederick Sound, Thomas Bay, and other locations across these two bodies of water (Figure 3-12). Frederick Sound and Thomas Bay have been used as viewing positions for the purposes of scenic assessment.



The majority of the seen area is within the Scenic Viewshed Land Use Designation. In areas managed as Scenic Viewshed, seen areas will have a natural-appearing landscape. Planned timber harvest units will typically be small and affect only a minor percentage of the viewshed. Roads, facilities, and other structures are either not visible or subordinate to the landscape. Seldom seen areas within the Scenic Viewshed and Use Areas designated as Modified Landscape and Timber Production may be more extensively modified (Appendix D).

### Adopted Visual Quality Objectives

Visual Quality Objectives (VQOs) refer to the degree of acceptable alterations of the landscape. Adopted VQOs are the Forest Plan management direction as described below.

**Retention:** Changes in the landscape must not be evident to the casual forest observer. Modifications must repeat form, line, color, and texture found in the surrounding natural landscape.

**Partial Retention:** Changes in the landscape may be evident, but are subordinate to the surrounding landscape. Activities may introduce form, line, color, and texture not common in the surrounding landscape, but they should not attract attention.

**Modification:** Changes in the landscape may dominate the surrounding natural landscape, however they must repeat the naturally established elements of form, line, color, and texture to appear compatible with the surrounding natural landscape.

**Maximum Modification:** Management activities may dominate the surrounding natural landscape, yet when viewed in the background activities appear as natural occurrences within the landscape.

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**Table 3-32.**  
**Adopted Visual Quality Objectives in the Project Area**

<u>Visual Quality Objective</u>	<u>% of Project Area</u>
Retention	10%
Partial Retention	30%
Modification	33%
Maximum Modification	27%

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Headlands and ridge faces beyond the shorelines of Thomas Bay and Frederick Sound viewed from up to five miles away are identified as Partial Retention. The interior slopes of the upper Muddy River drainage have an Adopted VQO of Modification. Most of the seldom seen area in the Crystal Creek and upper Patterson River drainages and the remainder of the Muddy River drainage have an Adopted VQO of Maximum Modification.

## Effects of the Alternatives by Viewshed

The Visual Quality Objectives of Retention and Partial Retention are achieved under all action alternatives because a natural or near natural appearing character is maintained.

None of the proposed alternatives would have a significant scenic impact as viewed from the entrance to Thomas Bay, Bock Bight, the saltwater channel east of Ruth Island, the saltwater channel west of Ruth Island, and saltwater areas near the mouth of the Patterson River. Visual contrast between the proposed harvest activity and the natural landscape would be reduced by the limited number of units, the size of harvest units and silvicultural treatments, the distance at which they are observed, and screening by foreground vegetation.

**Table 3-33.**  
**Seen Area Harvested As Viewed from All Priority Travel Routes and Use Areas**

	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	Acre	%	Acre	%	Acre	%	Acre	%	Acre	%
Visible Acres Proposed for Harvest <sup>~</sup>	0	0	150	1	120	0.8	100	0.6	121	0.7
Proposed Harvest Acres Using Partial Harvest*	0	0	52	35	45	37	14	14	87	72

<sup>~</sup> Assumes that there are 15,500 acres visible from Priority Travel Routes and Use Areas

\* Includes only those visible acres proposed for harvest.

## Frederick Sound Viewshed

### *Alternative 1*

No units are proposed for harvest under Alternative 1. Almost the entire viewshed currently exists in a natural appearing condition. Those areas appearing heavily altered are located in the Muddy and Patterson River areas, which are not visible from most locations in Frederick Sound. The scenic condition would improve as a result in continuing growth of vegetation.

### *Alternative 2*

Seven units are expected to be within view from the Alaska Marine Highway and other areas of Frederick Sound in the background distance zone. None of these units would be evident from Petersburg. All units should appear natural as seen from the Frederick Sound viewshed. Portions of units 23, 29, 30, 32, and 35 located near Ess Lake and units 44 and 45 located mid-slope near the mouth of Crystal Creek may be evident from various locations.

### *Alternative 3*

Alternative 3 has slightly more harvest area visible in the Ess Lake area, but none near the mouth of Crystal Creek. Units 23, 29, and 37 in the Ess Lake area are group selection harvest units and would likely not be visible to most observers. Units 17, 32, and 35 which are clearcut with reserves would be more apparent to observers but would achieve the Partial Retention Visual Quality Objective.



#### *Alternative 4*

Units 32 and 35 near Ess Lake and Unit 44 in the Muddy River drainage may be seen but would achieve the Partial Retention Visual Quality Objective.

#### *Alternative 5*

Portions of Units 13, 17, 30, 33, and 44 may be visible from Frederick Sound. Units 13 and 17, which are group selection, will be less evident than the others which are clearcut with reserves units. All units have been designed to meet the Partial Retention Visual Quality Objective.

### **Thomas Bay Viewshed**

#### *Alternative 1*

No units are proposed for harvest under Alternative 1. The most highly evident visual impacts in the Thomas Bay area are three older clearcuts located just south of the Cascade Creek cabin. Other heavily altered areas beyond the foreground distance zone are located in the Muddy and Patterson River drainages and not visible for the most part from locations in Thomas Bay. The scenic condition would improve as a result in continuing growth of vegetation.

#### *Alternative 2*

Eight units (23,25,29,30,31,32,35 and 85) may be visible in the middleground distance to varying degrees near the mouth of the Patterson River. Little visibility of these units is anticipated in other locations. Units 23, 32, and 85 are proposed as group selection harvest and would likely not be evident to most people. Units 25, 29, 30, 31 and 35 are small clearcuts with reserves and would be slightly noticeable. All units are designed to meet the Retention or Partial Retention VQO. Other units, located on the Point Agassiz peninsula or in the Muddy River drainage, are not expected to be evident.

#### *Alternative 3*

Eight units (13,17,23,29,32,35, 37, and 43) may be visible to varying degrees near the mouth of the Patterson River. Little visibility of these units is anticipated in other locations in Thomas Bay. Units 13,17, 29, 37, and 43 are proposed as group selection harvest and would not be evident to most people. The remaining units are small and proposed for clearcuts with reserves. These three units are partially screened from view and would only appear slightly visible. All units have been designed to achieve the Retention or Partial Retention Visual Quality Objective.

#### *Alternative 4*

Six units in the vicinity of Ess Lake are within the seen area near the mouth of the Patterson River. Four of these units (23, 29, 37, and 43) are proposed for group selection treatment with only 10% removal and may be visible. The other two units (32 and 35) are small clearcuts with reserves and would appear slightly distinguishable. All units have been designed to achieve the Retention to Partial Retention Visual Quality Objective.

#### *Alternative 5*

This alternative proposes to harvest six units in the middleground viewing area of Thomas Bay, visible near the mouth of the Patterson River. Units 13, 17, 85 are proposed as group selection harvest and Units 30, 31, and 33, are proposed as clearcut with reserves. It is expected that the group selection harvest would not be evident to most people. The clearcut with reserves units are small and would appear only slightly evident. All units have been designed to meet Retention to Partial Retention Visual Quality Objective.



## **Other Viewing Locations**

Other viewing areas would include those not identified as visually sensitive or seen from established Visual Priority Travel Routes and Use Areas. Although not frequently viewed, these other locations may be affected by timber harvesting activities. Generally these areas cannot be seen from saltwater travel routes and use areas and are visited by recreationists, hunters, subsistence users, and Point Agassiz residents. These locations are classified as “seldom-seen” and are managed with less visual emphasis than those areas with higher sensitivity.

Alternative 3 does not propose any units on the Point Agassiz peninsula nor on the road to the resident locations. Alternatives 2 and 4 propose new road construction west of the existing LTF site to access six proposed units. The likely visual impact from the new road location would result in a Modification to Maximum Modification VQO.

Alternative 5 proposes partial construction of the road west of the existing LTF to access two units. Alternatives 2, 4, and 5 propose varying degrees of harvest on the road to the Point Agassiz residences. The harvest would appear partially to fully visible and meet Modification VQOs.

All action alternatives propose varying degrees of harvest in the Muddy River drainage. Alternatives 2, 3, and 4 propose new road construction and harvest in the Crystal Creek drainage with similar visual impact. The effects of the units proposed on the west side of Crystal Creek as viewed from Road 6106 are likely to result in a Maximum Modification VQO. No alternatives propose harvest visible from the river in the upper Patterson River drainage.

## **Cumulative Effects**

### *Thomas Bay Viewshed*

Past timber harvest in the Thomas Bay viewshed is isolated to an area near the mouth of the Patterson River where several units logged in the 1960's and a barge facility are evident. This project proposes smaller openings where group selection, single tree selection, and reserve trees in clearcuts will minimize the overall impacts upon scenery. This will help to maintain a natural appearing character throughout the rotation.

### *Frederick Sound Viewshed.*

Very little evidence of past timber harvest is seen from Petersburg, or from Alaska Marine Highway ferries, cruise ships, and other boats in Frederick Sound. The natural appearing character of the Frederick Sound viewshed will be maintained as a result of any of the action alternatives.

## **Mitigation Measures**

Effort was made to design the proposed units for the Crystal Creek Timber Harvest to maintain scenic quality. Group selection and reserve trees in clearcuts were prescribed to limit unit visibility from key viewing locations. Some harvest units were deferred from alternatives because they would create a cumulative amount of scenic impact and could not be otherwise mitigated. Further refinement of harvest unit design will occur throughout the analysis of alternatives. Unit boundaries will be shaped or feathered to blend into the surrounding landscape. Although not a specific mitigation measure for

scenery, riparian buffers help screen areas of harvest from view and provide color and texture to reduce visual contrast.

## Issue 5 - Transportation

The Thomas Bay road system is not connected to any towns or villages. Some roads go through sections of private and State owned lands. There are approximately eight full time and several summer residents in the area, who regularly use the existing roads for subsistence and recreation purposes. Access to these roads from Petersburg and other outside areas is by floatplane or boat. Currently, there are no maintained trails, public docks, or floatplane facilities in the Crystal Creek Project Area.

### Existing Roads

Forest roads are classified as either Forest Development Roads (FDRs) or temporary roads. FDRs are also referred to as "permanent" roads, "system" roads, or "specified" roads. Temporary roads are also called "spur" roads.

FDRs are developed and operated for long-term resource management purposes. These roads receive constant or intermittent use depending upon the timing of timber harvest. The FDRs form the primary transportation network in the project area.

The Crystal Creek Project Area has approximately 28 miles of existing FDR. Not all of these roads are currently open for highway class motor vehicle traffic (Appendix B).

Alder is closing several permanent roads. Some roads are being kept open by local residents to facilitate hunting and other uses. This document proposes a road management plan for the project area. New roads developed by alternative are described in Appendix B.

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**Table 3-34.**  
**Existing Forest Development Roads in the Crystal Creek Project Area.**

Road Number	Road Name	Length (miles)	Open Road (miles)
6100	Mud	3.1	3.1
6101	Patterson River	3.6	3.6
6103	Pirate's Peak	3.8	0
6252	Point Agassiz	4.1	4.1
6256	Muddy River	13.9	6.4
	Total	28.5	17.2

---



A temporary road is a short-term road developed and maintained for a limited time period. Current timber sale contracts require closure of these roads. This is an erosion control obligation of the timber buyer and cannot be waived. Closure is achieved by blocking access, removing all culverts and bridges, restoring the natural surface drainage patterns and putting the roadway back into vegetative production within 10 years.

There are approximately 28 miles of temporary roads. While most of these roads were closed after harvest was completed, many are still being used today. There are about 4.0 miles of open temporary roads from earlier timber sales. These roads will be inventoried, and a plan developed for closure. All alternatives including Alternative 1 assume that these open temporary roads will be closed.

### New Road Development

The action alternatives propose new roads for timber harvest access. Alternative 5 would construct the least amount of road and Alternative 2 would build the most. All new specified roads constructed would be closed after timber harvest, and the temporary roads obliterated.

In addition, a motorized vehicle closure to public access at the proposed Muddy River crossing by Crystal Creek is planned in Alternatives 2, 3, and 4. This closure will be in effect during and after timber harvest and is designed to reduce impacts to goats in the Horn Cliffs area and the risk of overharvesting wolves.

**Table 3-35.**

### Planned and Existing Open Road Miles

Alternative	Existing FDR Open Miles	Existing Temporary Road Open Miles	Proposed New FDR Miles	Planned Temporary Road Miles	New FDR Open Miles after timber harvest	Total Road Open Miles <sup>≈</sup>
1	17.2	4.0	0	0	0	21.2
2	17.2	4.0	15.4	6.0	2.7*	23.9
3	17.2	4.0	13.8	4.7	4.3*	25.5
4	17.2	4.0	12.7	10.6	2.7*	23.9
5	17.2	4.0	6.4	9.2	2.7*	23.9

<sup>≈</sup> Includes Forest Development Roads and the existing temporary roads. The existing temporary roads are included because they may not be closed immediately and are used to calculate open miles for wildlife. They are planned for closure in the future.

\* All proposed new Forest Development Roads will be closed. The 2.7 miles and 4.3 miles of additional open FDRs represents the reconstruction segments of the Muddy River Road, number 6256.

\* All proposed new Forest Development Roads will be closed. The 2.7 miles and 4.3 miles of additional open FDRs represents the reconstruction segments of the Muddy River Road, number 6256.



## **Log Transfer Facility (LTF)**

Prior to 1978, nearly 160 million board feet of timber passed over the existing log bulkhead. Since then, less than one million board feet of timber has used the LTF at Thomas Bay.

Underwater surveys done in September 1983 showed a small deposit of bark and wood debris. Animals living on the ocean floor near the log slide appeared plentiful and healthy. Dives in 1990 and 1997 reported no wood debris.

Field surveys did not locate any other acceptable sites for LTF construction. Therefore, alternatives are being considered for reconstruction of the existing log transfer facility and gravel barging operation (See Appendix C) at Thomas Bay.

## **Logging Camps**

There was a logging camp when the area was first logged in the 1960s and 1970s. Timber operators may use a floating camp or one of several appropriate sites within the project area. Appropriate permits as required by State and Federal agencies would need to be obtained at that time.

## **Sort Yards**

A sort yard can be developed along proposed FDR 44900 about 0.6 mile from the LTF.

## **Right-of-Way from the State of Alaska**

Approximately 0.3 mile of right-of-way will be needed from the State of Alaska for proposed FDR 44900.

# **Other Environmental Considerations**

There were many concerns raised during public scoping that are not significant issues because they are mitigated in the same way in all alternatives or are not significantly affected by any proposed activity.

## **Air Quality**

Emissions expected from implementing any of the action alternatives would be of short duration and are not expected to exceed State Ambient Air Quality Standards (Alaska Administrative Code, Title 18, Chapter 50).

## **Soils and Hydrology**

### **Soils**

#### **Soil Productivity**

Soil productivity is a critical element to the forest because it affects the productivity of most other forest resources. Tree growth, wildlife, and fish habitat are associated with soil productivity, which is the ability of a soil to grow plants. Soil depth and internal drainage have a major influence on soil productivity. Well-drained soils normally have the highest productivity.

#### **Soil Erosion**

Most undisturbed soils within the project area are resistant to surface erosion. Thick vegetative cover and surface organic duff layers protect the soils. When mineral soil is exposed, surface erosion can occur. Surface erosion can occur along stream banks, snowslides, avalanche tracts, and within V-notches.

Some landslides are found within the project area. Many landslides occur during or immediately after heavy rainfall when soils are saturated. Landslides usually occur on steep slopes that have soils with distinct subsurface slip planes. There is a large natural landslide on the mountainslope just to the east of the Muddy River. A landslide hazard inventory to describe the relative risk of management induced mass wasting uses four classes (low, moderate, high, and extreme). The Forest Plan standards and guidelines take forested land over 72 percent slope out of the tentatively suitable forest land.

**Table 3-36.**  
**Soil Hazard Classes**

Potential Landslide Hazard	Acres	Percent of Study Area
Low	31,998	50
Moderate	10,736	17
High	7,153	11.4
Extreme	13,720	21.6

#### **Soil Concerns and Mitigation**

In the action alternatives, some acreage on slopes exceeding 72 percent was included in proposed harvest units. These areas, even though they are located within unit boundaries, will be excluded from harvest through the use of group selection harvest and leaving reserve trees. The areas scattered on these slopes range from about 36 acres in Alternative 2 to about 246 acres in Alternative 3. Alternative 3 uses helicopter yarding on these slopes and no active landslides were observed in these proposed units.

**Table 3-37.**  
**Acres of Extreme Landslide Hazard Soils Within Proposed Harvest Units**

Alternative	Acres
1	0
2	36.3
3	245.5
4	58
5	81.8

## Hydrology

The Crystal Creek Project Area incorporates most of the non-glacier portions of the Patterson and Muddy River watersheds. Both rivers are fed by glacial melt. The water appears cloudy from the fine silts which have been ground from underlying rocks by the weight of advancing or receding ice. Both rivers have clear streams which dilute the cloudy water, improving the quality.

Both the Patterson and Muddy Rivers are classed as either active alluvial or glacial outwash channels. These channel types carry high volumes of bedload which deposit on point bars. The accumulation of these deposits causes active meandering and unstable channel banks.

Both rivers may have periodic flooding caused by ice dams formed downstream from the glacier face. When these ice dams break, large volumes of water, ice, debris, and rocks may cascade down the channel. These floods can wash away streamside forest and deposit large amounts of debris onto the flood plain and broad glacial outwash plain. Though this flooding has not occurred in recent years due to glacial retreat, it was common on the Patterson River as recently as 1972 according to local residents.

Peak flows may also occur as a result of rain on snow and glacial ice during the summer months. The volume of flow may be more than expected from rainfall alone since summer flow has already increased because of melting glacier ice.

Non-glacial tributary streams of both the Patterson and Muddy Rivers are confined by narrow valleys and exposed bedrock. Observation indicates that the tributary streams yield less than 50 percent of the total flow of either river. The 7,488 acre Crystal Creek watershed and the 1,648 acre Ess Lake watershed are the largest tributaries on the Muddy and Patterson Rivers, respectively. The 2,320 acre Bear Slough watershed, located on Point Agassiz, drains into Frederick Sound.

A total of 210 miles of stream channel have been identified and classified within the Crystal Creek Project Area. The most common channel types are classed either as glacial outwash (Patterson and Muddy Rivers) or as high gradient contained channels found on hill or mountain slopes.

### Cumulative Effects

Scheduling of activities through time can have a great effect on how watersheds function. Watershed recovery following disturbance occurs at varying rates depending on precipitation, soil productivity, and the amount of disturbance. Watershed recovery following clearcut harvest takes from 10 to 30 years in the Pacific Northwest (Athman and McCammon, 1989).

The Forest Plan standards and guidelines allow up to 20% harvest in a watershed within 30 years without detailed watershed analysis. No action alternative proposes harvest of more than 8.9 percent of any watershed in the 30-year period between 1968 and 1998. This percentage includes all openings created by partial harvest and clearcut with reserves. Table 3-38 summarizes the past and proposed harvest distribution by alternative.



# Legend




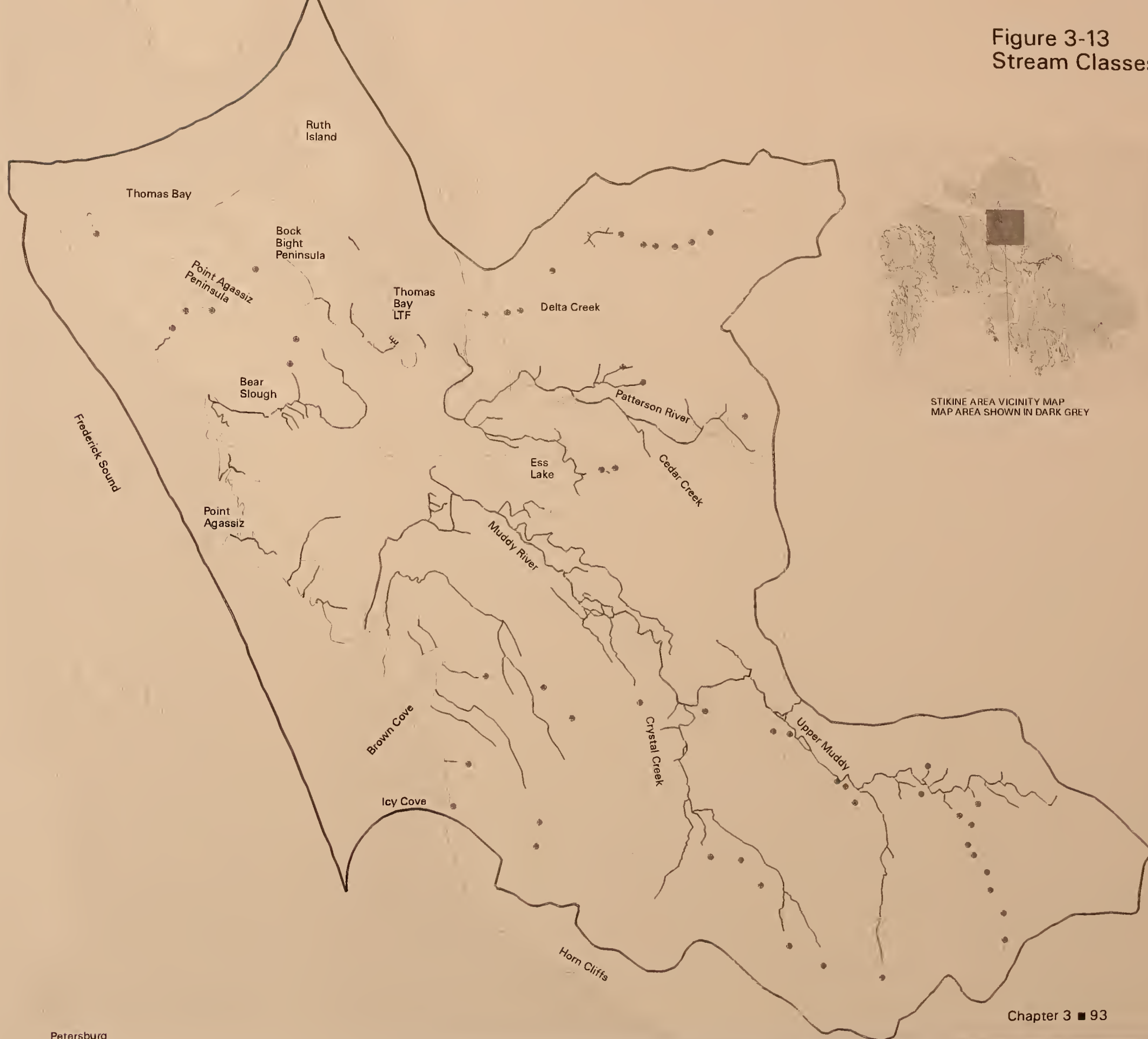
-  Class I Streams
-  Class II Streams
-  Class III Streams

Figure 3-13  
Stream Classes



STIKINE AREA VICINITY MAP  
MAP AREA SHOWN IN DARK GREY

0 7920 15840  
Scale is 1 inch = 7920 feet





**Table 3-38.**

**Acres and Percentage of Watershed Area Harvested Under Each Alternative**  
**Includes all prescriptions and all acres harvested between 1968-1998.**

Watershed/Area Name	Watershed Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Entire Planning Area (acres)	64,200	1,622	2,321	2,438	2,318	2,339
% of Area		2.6	3.6	3.8	3.6	3.7
Patterson River (acres)	11,332	118	140	186	124	170
% of Watershed		1.0	1.2	1.6	1.1	1.5
Ess Lake (acres)	1,648	20	145	136	108	39.2
% of Watershed		1.2	8.9	8.2	6.6	2.3
Cedar Creek (acres)	1,201	0	46	0	0	46
% of Watershed		0	3.8	0	0	3.8
Lower Muddy River (acres)	7,439	165	428	306	462	416
% of Watershed		2.2	5.7	4.1	6.2	5.6
Upper Muddy River (acres)	18,216	679	679	945	727	678
% of Watershed		3.7	3.7	5.2	4.0	3.7
Crystal Creek (acres)	7,488	340	542	528	420	340
% of Watershed		4.5	7.2	7.1	5.6	4.5
Bear Slough (acres)	2,320	0	134	0	145	68
% of Watershed		0	5.8	0	6.3	2.9

There are other mitigation measures that would benefit watershed function. Beach buffers will be a minimum of 1000 feet on all alternatives. Old growth reserve areas have been established in all alternatives. Forest Plan riparian management guidelines will extend stream protection measures to include smaller, non-fish bearing streams.

All roads will have erosion resistant rock surfaces. Full bench construction with end haul of excavated material will be done on steeper road sections. The number of road stream crossings proposed differs in by alternative. A summary of all proposed fishery stream and larger perennial non-fishery stream crossings is given in Table 3-39.



**Table 3-39.**

**Number of New or Reconstructed Road Stream Crossings by Alternative**

Watershed/Area Name	Stream Class*	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Entire Planning Area	I	0	6	6	6	2
	II	0	4	4	3	1
	III	0	6	7	7	0
Patterson River	I	0	0	0	0	0
	II	0	0	0	0	0
	III	0	0	0	0	0
Ess Lake	I	0	1	1	1	0
	II	0	1	0	0	1
	III	0	0	0	0	0
Cedar Creek	I	0	0	0	0	0
	II	0	0	0	0	0
	III	0	0	0	0	0
Lower Muddy River	I	0	2	2	2	1
	II	0	1	1	1	0
	III	0	2	2	2	0
Upper Muddy River	I	0	0	1	0	0
	II	0	0	2	0	0
	III	0	0	1	0	0
Crystal Creek	I	0	2	2	2	0
	II	0	1	1	1	0
	III	0	4	4	5	0
Bear Slough	I	0	1	0	1	1
	II	0	1	0	1	0
	III	0	0	0	0	0

\* Class I - Anadromous Fishery (salmon or steelhead)

Class II - Resident Fishery (cutthroat and other resident fish)

Class III - Perennial Stream with active channel width greater than five feet

All roads closed following the timber sale will be left in a condition that will restore the natural drainage patterns, as much as possible. To accomplish this, culverts and small bridges will be removed following harvest activities. Areas of exposed soil will be mulched and/or planted to minimize any road related erosion. Needed existing road erosion control measures and drainage improvement will be undertaken as part of all action alternatives.

A log and rootwad structure will be constructed along a 400-foot stretch of the Muddy River where a meander has eroded through the existing road. The structure will help prevent further erosion of the road. The meander may erode into a wetland area causing it to drain directly into the river since the river is lower.

### **Monitoring**

Implementation monitoring determines that site specific mitigation measures are implemented as designed. Effectiveness monitoring determines if these measures achieve the desired results. Activities such as buffer strip retention, seeding to reduce erosion, and waterbar installation will be monitored. Implementation monitoring is primarily done by the Timber Sale Administrator. Effectiveness monitoring is primarily done by Resource specialists.

### **Site Specific Evaluations**

- Small wooden bridges may be used instead of culverts at some sites. Their reuse at other sites will reduce impacts to fish migration and water quality. Water clarity and stream crossing costs will be monitored to evaluate this road management strategy.
- The log and rootwad structure along the Muddy River will be evaluated to determine if meander migration stops and has positive effects on fish habitat.

## **Fisheries**

Drainage basins within the Crystal Creek project area include:

- Patterson River (Alaska Department of Fish and Game #110-12-10070);
- Muddy River, (Alaska Department of Fish and Game #108-60-10030);
- Crystal Creek (Alaska Department of Fish and Game #108-60-10030-2022-3005);
- Delta Creek (No Alaska Department of Fish and Game Stream Number); and
- Bear Slough (No Alaska Department of Fish and Game Stream Number).

Other smaller streams have been grouped together for the fisheries analysis (Figure 3-13).

The Muddy River has several large tributaries that provide good salmon habitat. Channel and streambank instability, considerable streambed gravel movement, braiding, and instream organic debris, and a rather large flood plain characterize the main stem of the Muddy River. Due to high levels of glacier silt in the river, salmon are hard to see and population estimates are not available.

Crystal Creek is clear and has excellent spawning gravels. A waterfall is located approximately one mile from the confluence of the Muddy River. No anadromous fish have been found above the falls. The habitat above the waterfall is steep and other barriers are present. None of the barriers are good candidates for barrier modification. The tributaries flowing into Crystal Creek are mostly not fish-bearing streams because of barriers.



The Patterson River lacks large woody debris because the stream canopy is open, and the riparian vegetation is primarily alder. Due to high levels of glacier silt in the river, fish are hard to see and population estimates are not available.

The first tributary of the Patterson River drains Ess Lake, which is a rearing area for coho salmon and has a population of cutthroat trout. The lower part of this tributary has good spawning habitat. The area below the lake consists of a series of beaver ponds which form good rearing habitat for juvenile coho. A forty foot waterfall blocks the ponds above Ess Lake and no fish have been found. The barrier is not a potential habitat enhancement project.

The second tributary enters the Patterson River from the north. The lower portion of this tributary provide fair spawning habitat with a small amount of rearing habitat. The upper parts become steep with little to no spawning and rearing habitat.

Cedar Creek is the third tributary of Patterson River. The lower tenth mile has gravel/cobble substrates that provide fair spawning habitat. Very little rearing habitat exists in these areas. A large barrier falls is located a half mile above the confluence, and no fish were observed above the barrier. The barrier is not a potential habitat enhancement project.

Delta Creek is located north of the Patterson River. This stream has very little anadromous fish habitat, with a moderate-steep gradient, and is characterized by swift whitewater.

#### **Aquatic Habitat Management Unit Designation**

Aquatic Habitat Management Units are mapping units that display an identified value for aquatic resources. The Forest Plan redefines the AHMU Handbook definitions for classes of streams and adds a fourth classification of streams and a non-stream class:

**Class I** - "Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24) June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish."

**Class II** - "Streams and lakes with resident fish populations and generally steep (6-15 percent) gradient (can also include streams form 0-6 percent gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use."

**Class III** - "Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sufficient sediment and debris to have an immediate influence on downstream water quality or fish habitat capability. These streams generally have bankfull widths greater than 5 feet and are highly incised into the surrounding hillslope."

**Class IV** - "Other intermittent, ephemeral and small perennial channels with insufficient flow or sediment transport capabilities to have immediate influence on downstream water quality or fish habitat capabilities. These streams generally are shallowly incised into the surrounding hillslope."



**Non-streams** - "Rills and other watercourses, generally intermittent and less than 1 foot bankfull width, little or no incision into the surrounding hillslope, and with little or no evidence of scour."

Class IV streams have not been mapped for this DEIS. Class IV streams that require special protection will be mapped for the FEIS. If any other Class IV streams are found during layout of the timber harvest, they will be assessed for protection needs.

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**Table 3-40.**  
**Miles of Stream Classes in the Crystal Creek Project Area**

Stream	Class I	Class II	Class III	Total Miles
Patterson River	10.9	1.1	20.7	32.7
Cedar Creek	0.8	0.0	4.1	4.9
Ess Lake	3.3	0.5	3.0	6.8
Muddy River	21.0	0.4	1.3	22.7
Upper Muddy	16.2	6.4	29.4	52.0
Crystal Creek	9.3	3.1	20.3	32.7
Bear Slough	6.8	0.9	0.0	7.7
Others	21.7	9.0	20.7	51.4
Totals	90.0	21.4	99.5	210.9

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### **Channel Typing**

Channel types that have similar features are arranged into process groups. These process groups reflect the stream channel features such as substrate, gradient, large woody debris, sideslope characteristics, and riparian vegetation. The process groups can be used to predict the physical response of the streams to different management activities. The Forest Plan Riparian Management standards and guidelines are based on these process groups. These standards and guidelines were used for unit and road design. Table 3-41 gives the total mileage of each process group by stream.

**Table 3-41.**  
**Miles of Process Group in the Crystal Creek Project Area**

Stream	Flood Plain	Glacier Outwash	Alluvial Fan	Palustrine and Lake	Esturine	Moderate Gradient Mixed	Moderate Gradient Contained	High Gradient Contained	Total Miles
Patterson River	1.5	7.0	0.5	0.3	0.3	1.6	0.3	21.3	32.7
Cedar Creek	0.3	0.0	0.0	0.0	0.0	0.0	0.0	4.4	4.9
Ess Lake	1.1	0.0	0.0	2.6	0.0	0.4	0.0	2.6	6.8
Muddy River	2.7	10.2	0.0	7.8	0.0	0.3	0.0	1.8	22.7
Upper Muddy	2.1	9.3	0.9	0.4	0.0	4.2	0.0	35.0	52.0
Crystal Creek	1.7	0.1	0.0	0.0	0.0	6.4	1.1	23.0	32.7
Bear Slough	0.6	0.0	0.0	3.9	1.7	0.5	0.9	0.0	7.7
Others	3.0	2.6	0.7	1.3	5.5	6.1	4.5	24.0	51.4
Totals	13.0	29.2	2.1	16.3	7.5	19.5	6.8	112.1	210.9

### **Riparian Management Areas**

Riparian Management Areas are a combination of no harvest and windfirm buffers along all Class I, II, and III streams. The Tongass Timber Reform Act (TTRA) mandates the use of minimum 100-foot wide buffer strips along both sides of all Class I and Class II streams that flow directly into Class I streams. The Forest Plan prescribes further protection to streams by adding Riparian Management Area buffers of varied width depending on process group. All Class I and II streams and their associated wind buffers are outside harvest units planned for the Crystal Creek Project area (Appendix B).

### **Large Woody Debris**

Large woody debris is important to high quality fish habitat. It decreases water velocity, filters sediment, creates pool habitats, and provides fish cover from predators. Retention of trees within Riparian Management Areas will provide a continued long-term source of large woody debris for all alternatives.

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**Table 3-42.****Miles of Class I, Class II, and Class III No-programmed-harvest Stream Buffers for each Alternative Adjacent or Within a Unit Boundary.**

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Class I *	0.0	1.0	2.3	2.6	2.0
Class II *	0.0	1.1	1.3	1.0	0.0
Class III	0.0	2.1	11.2	8.4	0.7
Total Miles	0.0	4.2	14.8	12.0	2.7

\*Units were designed so that all Class I and II stream no-harvest buffers were outside of unit boundaries.

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### **Fish Populations**

No impacts to fish populations resulting from the Crystal Creek timber harvest are expected to be significant, as mitigation measures will reduce impacts. In turn, other species that depend on fish, such as bald eagles and river otters, should not have a significantly reduced prey base.

### **Fish Passage**

Fish passage can be maintained through the use of properly designed culverts and bridges. Culverts are typically used for road crossings of smaller streams; bridges are used for larger streams and rivers. In the Crystal Creek Project Area, the use of small removable wooden bridges instead of culverts is proposed for some small streams. Bridges will be considered for stream crossings when culverts cannot maintain acceptable fish passage.

### **Road Sediments**

Some short-term sediment increases during road construction can be expected from each of the action alternatives but should be minimized with implementation of best management practices. Long-term sediment increases from temporary roads are avoided by pulling drainage structures, waterbarring, and allowing road corridors to revegetate. Road maintenance will ensure that culverts are clear of debris.

Road construction timing clauses will be used to protect streams during migration, spawning, and egg incubation. No stream crossing construction should occur in streams in close proximity to anadromous fish streams for:

- coho salmon areas from August 1 - June 15;
- pink and chum salmon areas July 15 - May 15; and
- steelhead areas March 1 - July 18 (Alaska Department of Fish and Game, 1993).

Because of overlapping timing clauses, a compromise was developed which permits instream activities from May 15 to August 15 for areas needing timing clauses. See Appendix B for site specific timing clauses.



## Heritage Resources

### Temperature

By leaving a Riparian Management Area along streams, no thermal increases are expected. All Class I and Class II streams that flow directly into Class I streams have a mandatory 100 foot no-cut TTRA buffers. Class III streams do not contain fish, so no direct impacts to fish would occur. Class IV streams do not contain fish and contain little or no water, so no direct impact to fish would occur.

### Past Cultural Environment

The cultural resource evaluation of the Crystal Creek Project Area began by researching various historical and ethnographic accounts, previous cultural resource surveys, Alaska Heritage Resource Survey listings, Stikine Area files and atlases, special use permit files, land status atlases, and a fur farm index (Roberts n.d.). Informal interviews were conducted with Point Agassiz, Petersburg, and Kake residents.

Oral tradition and ethnographic accounts name the Tlingit Indian as the dominant Native people who resided in the region from Yakutat Bay south to Dixon Entrance (Arndt et al. 1987:88). Their social structure is composed of a number of kwans that refers to people living within fluctuating geographic areas. Clans are smaller and apparently more important political divisions within each kwan. Each clan is associated with hunting, fishing and berry picking territories, sets of personal names, legends of origin and migration, songs, dances, ceremonial objects, and family crests. (Olson 1967:1)

Historic activity in the project area is diverse and includes trapping, hunting, mining, commercial fishing, recreation, logging and permanent settlement. The earliest historically documented use of the area indicates the Gardner Shrimp Company operated on Ruth Island from 1916 to 1918. Around this time period, there was a non-Native settlement of approximately 45 residents on the Point Agassiz Peninsula.

### Previous Investigations

Forest Service archaeologists conducted five cultural resource surveys in the project area and one survey just outside the area between 1976 and 1991. Survey methods varied from selective visual reconnaissance to complete ground coverage with subsurface testing. All work was initiated in compliance with Section 106 of the National Historic Preservation Act. Formal documentation about the surveys and results are filed at the Stikine Area Supervisor's Office in Petersburg, Alaska. Some information pertaining to identified cultural resources is restricted from public access due to its sensitive and non-renewable nature.

### Investigation for this Project

Archaeologists discovered twelve new archaeological sites in the project area including six prehistoric period shell middens, two historic period shelters, one historic period mine and structure complex, one camp, one rock alignment and one historic period trail. Field crews visited a petroglyph site initially recorded in 1976 by Dan Brooks. They identified some previously undocumented petroglyphs in the immediate vicinity of this site and added them to the existing documentation. An Alaska Heritage Resource Survey number was assigned to a locally well-known petroglyph site some distance from the undocumented petroglyphs. Of the total, nine sites (six prehistoric middens, one historic shelter, two petroglyph sites) appear to meet National Register of Historic Places

eligibility criteria. Culturally modified trees were recorded; none appear to meet National Register eligibility criteria. No known sites are in areas proposed for timber harvest and associated ground disturbing activities.

All of the information will be detailed in a report submitted to the Alaska State Historic Preservation Officer. The conclusions will state that none of the cultural resources identified in the project area will be impacted by the proposed project. The Section 106 consultation process will be completed after the Alaska State Historic Preservation Officer and the Advisory Council on Historic Preservation concur. Some undiscovered sites may exist in the project area. If a new site is discovered, it will be evaluated. Mitigation plans will be initiated prior to any work that may adversely affect the resource.

### **Cumulative Effects**

Continued surveys and various mitigation measures will reduce the potential loss by preserving and documenting significant sites and by providing data about unpreservable sites. Periodic monitoring of road construction and timber harvest may identify newly exposed sites and assess any damages. Threats to significant cultural resources include development, decay, natural landscape changes such as erosion and windthrow, and increased visitation. Beach fringe, stream and estuary buffer zones will reduce possible impacts to cultural resources. Increased site access may result in cultural resource losses, vandalism, or looting.

## **Karst and Caves**

No rocks associated with karst formation, such as limestone or dolomite, were found. There is no evidence of karst development or caves anywhere within the project area.

## **Minerals**

There are two mining claims in the project area. At this time, neither of the mining claims have an approved Plan of Operation. This Plan of Operation would include mitigation measures to limit resource impacts.

## **Threatened, Endangered, and Sensitive Species**

### **Endangered and Threatened Wildlife**

Federally listed Threatened and Endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, under authority of the Endangered Species Act of 1973, as amended.

Endangered species known to occur within or adjacent to the project area include the humpback whale and the American peregrine falcon. Humpback whales are commonly found in Frederick Sound and may occasionally visit Thomas Bay. The American peregrine falcon may occur within the area as a transient migrant.

The only threatened species, the Steller sea lion, may be found in Thomas Bay and Frederick Sound. A sea lion haulout occurs on the shoreline rocks at the north end of Horn Cliffs within the Stikine-LeConte Wilderness Area. There are no sea lion rookeries in Frederick Sound or Thomas Bay near the Crystal Creek Project area.

None of the alternatives is expected to have any significant negative effects on humpback whales, Steller sea lions, or American peregrine falcon because of their limited occurrence and the lack of any identified critical habitat for these species within or adjacent to specific areas of proposed activities.



## Sensitive Wildlife

Sensitive species are those species identified by the Regional Forester for which population viability is a concern in the Alaska Region. The Forest Service has entered into a Memorandum of Understanding with the U.S. Fish and Wildlife Service, other federal agencies, and the Alaska Department of Fish and Game, to cooperate in the conservation of species tending toward federal listing so that listing is unnecessary.

The Alaska Region's Sensitive Species list is presently undergoing revision. Currently, there are eight Sensitive animal species that are known or likely to occur in the Crystal Creek Project Area (Table 3-43).

Table 3-43.

Current and Proposed Alaska Region Sensitive Animal Species that Are Known or likely to occur within the Crystal Creek Project Area

Common Name	Scientific Name	Forest Service Status*
Alexander Archipelago wolf	<i>Canis lupus ligoni</i>	Proposed Sensitive
Keen's myotis	<i>Myotis keenii</i>	Proposed Sensitive
Trumpeter swan	<i>Cygnus buccinator</i>	Sensitive
Osprey	<i>Pandion haliaetus carolinensis</i>	Sensitive
Queen Charlotte goshawk	<i>Accipiter gentilis laingi</i>	Sensitive
Peale's peregrine falcon	<i>Falco peregrinus peali</i>	Sensitive
Marbled murrelet	<i>Brachyramphus marmoratus</i>	Proposed Sensitive
Spotted frog	<i>Rana pretiosa</i>	Proposed Sensitive

\* Forest Service Status identified in the Forest Plan.

**Alexander Archipelago Wolf:** The wolf is discussed in Biodiversity, Issue 3.

**Keen's myotis:** The occurrence of this bat in southeastern Alaska is based on single specimens collected on Wrangell Island in the 1890s and on Prince of Wales Island in 1993 (MacDonald and Cook 1994). Other locality records of the specimen occur in British Columbia and Washington's Olympic Peninsula. So little is known about the species that its habitat requirements are uncertain. This species probably uses large-diameter snags and decaying trees for hibernating, roosting, and rearing young.

**Queen Charlotte goshawk:** This subspecies of goshawk is a resident raptor in Southeast Alaska that prefers productive old-growth for nesting and foraging. Several goshawks were sighted during the summer of 1996 in the Patterson and Muddy River drainages. Nesting may occur within the project area. Goshawk surveys were done in 1996 and 1997, but no nest sites have been located.

**Marbled murrelet:** This seabird species prefers old-growth trees with lichens for nesting. It has recently been listed as Threatened in Washington, Oregon, and California, due in part to extensive loss of old-growth forests. Limited surveys in 1996 indicate that murrelets nest within the project area. The actual detection of nests is very difficult, and no nest sites have been located to date.



**Keen's Myotis, Queen Charlotte Goshawk, and Marbled Murrelet:** These three Sensitive Species are best measured by the amount of older, higher volume (i.e. 20,000+ board feet/acre) forests. The placement of reserve blocks of old growth throughout the project area, together with riparian and beach fringe buffers and other remaining old growth forests that will not be harvested, should assure that viable populations are maintained. In addition, the presence of the Stikine-LeConte Wilderness and the Spires Roadless Area adjacent to the project area maintains habitat for these species.

Of the estimated 21,060 acres of older, higher volume forests that originally occurred within the project area, about 14,905 acres (70.8%) are still unlogged on National Forest Lands and a few acres remain on State land near the head of the Thomas Bay. The action alternatives propose to harvest between 2.4 and 3.8% of the remaining older, higher volume forests.

If murrelet nests are found, they will be protected with 600-foot buffers and timing clauses. All harvest units in the selected alternative will be surveyed for goshawk nests during timber harvest layout. If goshawk nests are located, they will be protected by 100-acre nesting habitat buffers and timing clauses. Possible murrelet and goshawk nesting habitat will be reduced by 2.4 to 3.8%, in the action alternatives.

About 15% of the basal area in all units proposed for clearcutting will be retained and will provide snags for roosting, mossy limbs for nesting, and perch trees. These reserve trees will be located singly or in clumps and should provide some usable habitat for bats, goshawks, and murrelets.

**Trumpeter Swan:** Trumpeter swans are common within the project area during spring and fall migration and during mild winter months when lakes and ponds are ice-free. Swans were observed in several of the larger muskeg ponds of the Muddy River drainage, during the mild winters of 1978-1980. There is no known swan nesting in the Stikine Area. Swans are not known to winter within the project area during periods of severe cold.

Beach, estuarine, and riparian buffers will minimize potential disturbances to migratory habitat in all alternatives. Swans have been observed during the winter in two ponds along Road 6256. Efforts will be made to maintain or create a vegetation buffer between these ponds and the road to screen traffic. A timing clause will limit reconstruction within 0.5 mile of the wetlands used by swans during the time period when wintering or migratory swans may be present.

**Osprey:** The project area is one of the few areas in Southeast Alaska that has a known nesting population of osprey. Since 1976, seven nest trees have been located. Five of these occurred in snags in clearcuts on State land. Four of these nest trees have since fallen down or deteriorated. The remaining nest on State land and the nest on national forest land were active most years between 1990 and 1997. A new active nest was located in 1996 on national forest land in a large spruce. These nests have been located in or at the edge of openings providing the birds an unobstructed view of the surrounding area.

One active osprey nest occurs adjacent to two proposed units in Alternative 5, and is adjacent to one unit proposed unit in Alternative 4. This nest is adjacent to a second growth unit that is proposed for thinning in all alternatives. Timing clauses will be placed on activities in these units to prevent disturbances to the nesting site if occupied. Searches for osprey nests will be conducted within and adjacent to all proposed harvest

units and second growth treatment areas where osprey nesting may occur. Buffers and timing clauses will be used to protect any osprey nests. Proposed timber harvest within these areas will retain some existing snags and reserve trees that would be suitable for osprey nest construction (see Appendix B).

Two osprey nesting platforms have been constructed within the project area. One was constructed southeast of the gravel pit in 1992. This platform was inactive from 1993-1995 and not monitored in 1996. The second nesting platform was constructed along the beach south of Wood Point in the fall of 1996 and was not active in 1997.

**Peale's peregrine falcon:** In Southeast Alaska, the nests of this falcon subspecies have been located primarily along cliffs facing the open ocean and near large seabird colonies. No nests have been reported along the inside waters adjacent to or within the project area. This falcon probably migrates through the project area following the coastline.

No significant negative impacts are expected on this subspecies in any of the alternatives. Beach and estuarine buffers should minimize disturbances to habitats that are used most frequently during migration.

**Spotted frog:** Spotted frogs are generally found in or adjacent to permanent freshwater bodies, usually in association with grasses, sedges, and rushes. Spotted frogs were found in three small pools in sphagnum-dominated muskegs on the Point Agassiz Peninsula during the summer of 1996 and may occur in other wetland sites within the project area.

Spotted frogs have not been found in or adjacent to any of the proposed roads, proposed units, or potential second growth treatment areas. The total acres where frogs may be affected by proposed units or new roads are: Alternative 1, 0 acres, Alternative 2, 238 acres, Alternative 3, 109 acres, Alternative 4, 264 acres, and Alternative 5, 5 acres. If spotted frogs are found in proposed road right-of-ways, road locations will be altered, if feasible. If spotted frog habitat is found within proposed harvest units, buffers will be established around the habitat.

## Sensitive Plants

Of the 22 plant species designated as Sensitive in the Alaska Region, fifteen are known or suspected to occur in the Petersburg Ranger District (Table 3-44). In addition, ascending moonwort fern (*Botrychium ascendens*), super round wedge moonwort fern (*Botrychium unnamed*), and *Salix reticulate* spp. *glabellcarpa* (willow-no common name) were identified as proposed Sensitive species in the Forest Plan.

Botanical surveys were conducted in various habitats within the project area. No sensitive plants were found during these surveys (Dillman and Pawuk 1996). The known sensitive plant species in the Petersburg Ranger District are Wright filmy fern, Choris bog orchid, Davy Mannagrass, and loose-flowered bluegrass. The only sensitive plant located on the mainland was loose-flowered bluegrass in an estuarine meadow in Sandborn Canal. If sensitive plants are located within or adjacent to areas where activities are proposed, appropriate mitigation measures will be taken.



Table 3-44.

Current Alaska Region Sensitive Plant Species That Are Known or Likely to Occur on the Petersburg Ranger District\*

Common Name	Scientific Name	Forest Service Status
Goose-grass sedge	<i>Carex lenticularis</i> var. <i>dolia</i>	Sensitive
Edible thistle	<i>Cirsium edule</i>	Sensitive
Northern rockcress	<i>Draba borealis</i> var. <i>maxima</i>	Sensitive
Davy mannagrass	<i>Glyceria leptostachya</i>	Sensitive
Wright filmy fern	<i>Hymenophyllum wrightii</i>	Sensitive
Truncate quillwort	<i>Isoetes truncata</i>	Sensitive
Calder lovage	<i>Ligusticum calderi</i>	Sensitive
Choris bog orchid	<i>Platanthera gracilis</i>	Sensitive
Bog orchid	<i>Platanthera gracilis</i>	Sensitive
Loose-flowered bluegrass	<i>Poa laxiflora</i>	Sensitive
Kamchatka alkali grass	<i>Puccinellia kamtschatica</i>	Sensitive
Straight-beak buttercup	<i>Ranunculus orthorhynchus</i> var. <i>alaschensis</i>	Sensitive
Unalaska mist-maid	<i>Romanzoffia unalaschcensis</i>	Sensitive
Queen Charlotte butterweed	<i>Senecio moresbiensis</i>	Sensitive
Circumpolar starwort	<i>Stellaria ruscifolia</i> spp. <i>aleutica</i>	Sensitive
Ascending moonwort fern	<i>Botrychium ascendens</i>	Proposed Sensitive
Super round wedge moonwort fern	<i>Botrychium unnamed</i>	Proposed Sensitive
Willow (no common name)	<i>Salix reticulate</i> spp. <i>glabellcarpa</i>	Proposed Sensitive

\* Dillman and Pawuk 1996.



## Wetlands

Approximately 38 % of the Crystal Creek Project Area is classified as wetlands by the Stikine Area Soil Resource Inventory, which shows areas of hydric soils and wetland plants (See Table 3-45). Wetlands moderate flooding, reduce runoff and sedimentation, provide wildlife and plant habitat, and may sustain stream flow during dry periods.

**Table 3-45.**  
**Wetland Habitats, Dominant Vegetation and Acreage for the Project Area**

Wetland Habitat Type	Typical Species	Wetland Acreage	% of Area
Subalpine Forest/ Muskeg Mosaic	mountain hemlock, deer cabbage, sedges, low growing blueberry, and heaths	3,864	6
Alpine Wetlands	heaths, crowberry, mountain heather, blueberry, caltha- leafed avens	5,418	8
Estuaries	seaside plantain, sea mildwort, sedges	1,290	2
Forested Wetland	western hemlock, Alaska yellow- cedar, Sitka spruce, mountain hemlock, skunk cabbage, deer cabbage	3,374	5
Muskeg (Bog)	sphagnum moss, marsh marigold, crowberry, labrador tea, shore pine	2,960	5
Muskeg/Forested Wetland Mosaic	western hemlock, Sitka spruce, mountain hemlock, yellow cedar, shore pine, sphagnum moss, sedges, crowberry	7,168	11
Emergent Sedge Muskeg (Sedge Fen)	sedges	716	1
Total		24,790	38

Some disturbance of wetlands is expected to result from timber harvest (Table 3-46). These impacts are generally short-term due to the regeneration of vegetation. Some longer term impacts will result from new road construction in wetlands (Table 3-47). Permanent loss of wetland vegetation will occur where fill is placed in wetlands to form the road foundations. The types of potential impacts to wetlands from implementation of the action alternatives include: 1) loss of wetland vegetation, 2) erosion and increased sedimentation loading, 3) loss of flooding control, and 4) loss of wildlife habitat.

**Table 3-46.**

**Acres of Wetland Within Proposed Harvest Units\***

Wetland Type	Wetland Acres Project Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Forested Wetland	3,374	0	198	96	216	1
Muskeg/Forested Wetland Mosaic	7,168	0	0	5	9	0
Total	10,542	0	198	101	225	1

\* Acres shown in the table include the entire unit size not the harvested acres. Harvested acres will be less due to partial harvest methods. Wetland acres will be avoided where possible within the units.

**Table 3-47.**

**Acres of Road\* Proposed through Wetlands**

Wetland Type	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Forested Wetland	0	24	6	23	2
Muskeg/Forested Wetland Mosaic	0	14	2	14	0
Marsh	0	1	0	1	1
Sedge Fen	0	1	0	1	1
Total	0	40	8	39	4

\* Assumes six acres per mile of road.

**Erosion and Increased Sedimentation** Erosion may occur as a result of road construction, heavy equipment use, and log yarding. The risk of sedimentation as a result of harvest activities is generally low because of logging slash covering the soil surface and rapid regrowth of vegetation

**Floodflow Reduction** Changes in stream flows are expected to be minimal. A slight change in peak flows and surface flows may result from filling wetlands for road construction. This may result in some erosion, channel adjustment, and sedimentation.

**Loss of Wetland Wildlife Habitat** Loss of wildlife habitat in wetlands is expected to be temporary due to vegetation regeneration. Disruption of wildlife migration corridors may occur. Alternatives 2, 4, and 5 propose road construction in 1 acre of sedge fen which is good wildlife habitat. Alternative 3 disturbs no sedge fen.

**Mitigation** Road routes avoided wetlands wherever feasible. To avoid artificial interception of water by roads, free draining coarse textured rock will be used in road foundations, uphill ditches will be limited, and installation of adequate size and numbers of culverts will be required.

**Wetland Enhancement** A project is proposed on a low gradient tributary channel located northeast of the Muddy River. A beaver dam had blocked a culvert causing the water level to rise and enlarge an existing wetland. After the beaver dam was cleared to prevent road flooding, wetland plant species declined. Strategically placed large logs will reestablish a higher water level without washing out the road and the effects on coho salmon and waterfowl will be evaluated.



# **Chapter 4**

## **List of Preparers**

# Chapter 1

The first chapter of the book is devoted to the study of the properties of the function  $f(x)$  defined on the interval  $[0, 1]$ . The function is defined by the formula  $f(x) = x^2$  for  $x \in [0, 1]$ . The function is continuous and differentiable on the interval  $[0, 1]$ . The derivative of the function is  $f'(x) = 2x$  for  $x \in [0, 1]$ . The function is increasing on the interval  $[0, 1]$ . The function is concave down on the interval  $[0, 1]$ . The function has a minimum at  $x = 0$  and a maximum at  $x = 1$ . The function is symmetric about the line  $x = 0.5$ . The function is periodic with period 1. The function is bounded on the interval  $[0, 1]$ . The function is integrable on the interval  $[0, 1]$ . The function is measurable on the interval  $[0, 1]$ . The function is continuous on the interval  $[0, 1]$ . The function is differentiable on the interval  $[0, 1]$ . The function is increasing on the interval  $[0, 1]$ . The function is concave down on the interval  $[0, 1]$ . The function has a minimum at  $x = 0$  and a maximum at  $x = 1$ . The function is symmetric about the line  $x = 0.5$ . The function is periodic with period 1. The function is bounded on the interval  $[0, 1]$ . The function is integrable on the interval  $[0, 1]$ . The function is measurable on the interval  $[0, 1]$ .

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# Chapter 4

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# Glossary





# Glossary

## **Alaska National Interest Lands Conservation Act (ANILCA)**

The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96<sup>th</sup> Congress, 94 Stat. 2371-2551. Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. In section 705(a) Congress directed that at least \$40,000,000 be made available annually to the Tongass Timber Supply Fund to maintain the timber supply from the Tongass National Forest at a rate of 4.5 billion board feet per decade. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

## **Allowable Sale Quantity (ASQ)**

ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity expressed as a board foot measure is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

## **Anadromous Fish**

Anadromous fish (such as salmon and steelhead) spend part of their lives in fresh water and part of their lives in salt water.

## **Anadromous Fisheries Habitat Assessment (AFHA)**

An assessment conducted within the Tongass National Forest (1994) to study the effectiveness of current procedures for protecting anadromous fish habitat and determine the need for any additional protection.

## **Basal Area**

Total cross-sectional area of all the trees in a stand. This is measured at diameter breast height (DBH) and can be expressed in either square feet per acre or square meters per hectare.

## **Biodiversity**

A concept applied to a given area or region that includes the variety of and variability among living organisms and the ecological complexes in which they occur. In Southeast Alaska, biodiversity is most often associated with the array of species dependent on old-growth forest habitat.

## **Board foot**

A unit of timber measurement equaling the amount of wood contained in an unfinished board one inch thick, twelve inches long, and 12 inches wide.

## **Channel Type**

A means of distinguishing parts of a stream system into segments which have fairly consistent physical and biological characteristics. For descriptions, see 'Channel Type Field Guide,' Forest Service publication R10-MB-6.

## **Clearcut with Reserves**

A silvicultural method in which the majority of the trees in a harvest unit are cut in one entry, and the rest are left as residual trees, either singly or in patches. The residual trees remain unharvested to provide structural diversity and older-aged trees within the second-growth stand. The Forest Plan refers to this as two-aged management.

## **Distance Zone**

Areas of landscapes visible from priority travel routes and use areas categorized by distance criteria. (Foreground: 0 to ¼- ½ mile, Middleground: ¼ - ½ to 3-5 miles, or Background: greater than 3-5 miles). Used as a frame of reference in which to discuss landscape characteristics and management activities.

<b>Endangered Species</b>	Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1978 Endangered Species Act.
<b>Estuary</b>	An ecological system at the mouth of a stream where fresh water and salt water mix, and where salt marshes and intertidal mudflats are present. The landward extent of an estuary is the limit of salt-intolerant vegetation, and the seaward extent is a stream's delta at mean low water.
<b>Even-aged Management</b>	The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees in forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.
<b>Falldown</b>	The difference between the number of acres planned for timber harvest and those actually harvested, usually experienced as a reduction in acres. Falldown results from many factors, including unmapped unsuitable timber land, newly available information, and project-level consideration of site-specific issues and non-timber resource needs.
<b>Forest Plan</b>	Source of management direction for an individual Forest specifying activity and output levels for a period of 10-15 years. Management direction in the plan is based on issues identified at the time of the plan's development.
<b>Gap Phase Dynamics</b>	When the death of one or a few overstory trees acts like a small minor disturbance and permits a small, single-even-aged stand to grow from existing vegetation or seed germination.
<b>Group Selection</b>	A harvesting method in which trees are removed in small groups at a time, usually less than two acres.
<b>Interdisciplinary Team (IDT)</b>	A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem.
<b>Land Use Designation (LUD)</b>	A defined area of land to which specific management direction is applied.
<b>Log Transfer Facility (LTF)</b>	Log Transfer Facilities include the site and structures used for moving logs and timber products from land-based transportation forms to water-based transportation forms.
<b>Management Indicator Species (MIS)</b>	Species selected in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.
<b>Muskeg</b>	A bog, often dominated by sphagnum moss, frequently with deep accumulations of organic material, occurring in wet, poorly drained northern regions.
<b>National Environmental Policy Act of 1969 (NEPA)</b>	An act declaring a National policy to encourage productive harmony between humans and their environment, to promote efforts which will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans, to enrich the understanding of the ecological systems and natural resources important to the Nation and to a Council on Environmental Quality.



<b>National Forest Management Act (NFMA)</b>	A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Forest plans.
<b>Old growth</b>	Ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include larger tree size, higher accumulations of large dead woody material, multiple canopy layers, different species composition, and different ecosystem function. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.
<b>Old Growth Habitat Reserves (OGR)</b>	A contiguous unit of old-growth forest habitat to be managed to maintain the integrity of the old-growth forest ecosystem.
<b>Overstory</b>	The portion of trees in a forest which forms the upper most layer of foliage.
<b>Process Group</b>	A combination of similar channel types based on major differences in landform, gradient, and channel shapes.
<b>Productive Old Growth</b>	Old-growth stands with 8,000 or more board feet of timber per acre.
<b>Programmed Commercial Timber Harvest</b>	Timber harvest that occurs on suitable forested lands that is chargeable to (contributes to) the Allowable Sale Quantity.
<b>Recreation Opportunity Spectrum (ROS)</b>	<p>A system for planning and managing resources that categorizes recreation opportunities into seven classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area and the relative density of recreation use. The four classes found in the Crystal Creek Project Area are:</p> <p><i>Primitive:</i> An unmodified environment generally greater than 5,000 acres in size and located generally at least three miles from all roads and other motorized travel routes. A very low concentration of users results in a very high probability of experiencing solitude, freedom, closeness to nature, tranquillity, self-reliance, challenge, and risk. Evidence of other users is low.</p> <p><i>Semi-Primitive Non-motorized:</i> A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located at least ½ mile (greater or less depending on terrain and vegetation, but no less than ¼ mile) but not further than 3 miles from all roads and other motorized travel routes. Concentration of users is low but there is often evidence of other users. There is a high probability of experiencing solitude, freedom, closeness of nature, tranquillity, self-reliance, challenge, and risk. No roads are present in the area.</p> <p><i>Semi-Primitive Motorized:</i> A natural or natural-appearing environment generally greater than 2,500 acres in size and generally located within ½ mile of primitive roads and other motorized travel routes; but not closer than ½ mile (greater or less depending on terrain and vegetation, but no less than ¼ mile) from better-than-primitive roads and other motored travel routes. Concentration of users is low but there is often evidence of other users. There is a moderate probability of experiencing solitude, closeness to</p>



nature, and tranquillity along with a high degree of self-reliance, challenge, and risk in using motorized equipment. Local roads may be present, or along saltwater shorelines there may be extensive boat traffic.

*Roaded Modified:* Vegetative and landform alterations typically dominate the landscape. There is little on-site control of users except for gated roads. There is moderate evidence of other users on roads (generally less than 20 group encounters per day), and little evidence of others or interactions at campsites. There is opportunity to get away from others but with easy access. Some self-reliance is required in building campsites and use of motorized equipment. A feeling of independence and freedom exists with little challenge and risk. Recreation users will likely encounter timber management activities.

<b>Roads</b>	<p><i>Specified Roads:</i> Those roads including related transportation facilities and appurtenances, listed in timber sale contracts for construction or reconstruction by the timber purchaser in accordance with locations and specifications provided by the Forest Service. Those Forest Development roads planned for recurrent land management uses and for which the timber sale contract specifies the location, standards, and specifications.</p> <p><i>Temporary Roads:</i> Low-level roads constructed for a single purpose and short-term use. Once use of the road has been completed, it is obliterated, and the land it occupied is returned to production.</p>
<b>Sawtimber</b>	Trees that are suitable in size and quality for the production of dimension lumber.
<b>Scoping</b>	Determination of the significant issues to be addressed in an environmental impact statement.
<b>Second Growth</b>	Forest growth that has come up naturally or has been planted after some drastic interference (for example, clearcut harvest, serious fire, or insect attack) with the previous forest growth.
<b>Seen Landscape</b>	See viewshed.
<b>Seldom-seen Landscape</b>	Those areas not visible from the most frequently used travelways (boat route, recreation road, or trail) or use area (recreation cabin or anchorage).
<b>Sensitive Species</b>	Animal and plant species identified by the Regional Forester as potentially susceptible or vulnerable to activity impacts or habitat alterations and, therefore, in need of special considerations during land management activity planning.
<b>Silviculture</b>	The branch of forestry involving the theory and practice of manipulating the establishment, composition, structure, and growth of forest vegetation. Silviculture involves the appropriate application of ecological, social, and economic principles of vegetative management to achieve resource management objectives and desired future forest conditions.
<b>Silvicultural Prescription</b>	A technical document which provides detailed implementation direction about methods, techniques, timing, and monitoring of vegetative treatments. A prescription is prepared after a preferred treatment alternative has been selected, but before the project is implemented. A prescription is prepared by a silviculturalist who uses interdisciplinary input to best achieve established objectives, direction, and requirements for land managed by the USDA Forest Service.

<b>Single Tree Selection</b>	A cutting method to develop and maintain uneven-aged stands by removal of selected trees from specified age classes over the entire stand area in order to meet a predetermined goal of age distribution and species in the remaining stand.
<b>Sortyard</b>	A location for sorting logs. Generally used to sort grades, types, and size of logs.
<b>Stream Class</b>	<p>A means to categorize stream channels based on their fish production values. There are four stream classes on the Tongass National Forest. They are:</p> <p><i>Class I.</i> Streams and lakes with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to be reasonable enhancement opportunities for anadromous fish.</p> <p><i>Class II.</i> Streams and lakes with resident fish populations and generally steep (6-15%) gradient (can also include streams from 0-5% gradient) where no anadromous fish occur, and otherwise not meeting Class I criteria. These populations have limited fisheries values and generally occur upstream of migration barriers or have other habitat features that preclude anadromous fish use.</p> <p><i>Class III.</i> Perennial and intermittent streams with no fish populations but which have sufficient flow or transport sediment and debris to have an immediate influence on downstream water quality or fish habitat capability. These streams generally have bankfull widths greater than five feet and are highly incised into the surrounding hillslope.</p> <p><i>Class IV.</i> Intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. These streams generally are shallowly incised into the surrounding hillslope.</p> <p><i>Non-streams.</i> Rills and other watercourses, generally intermittent and less than one foot in bankfull width, little or no incisement into the surrounding hillslope, and with little or no evidence or scour.</p>
<b>Tentatively Suitable Forest Land</b>	<p>Forest land that is producing or is capable of producing crops of industrial wood and:</p> <ol style="list-style-type: none"> <li>has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service;</li> <li>existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions;</li> <li>existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within five years after final harvest; and</li> <li>adequate information is available to project responses to timber management activities.</li> </ol>
<b>Threatened Species</b>	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species.
<b>Tiering</b>	Elimination of repetitive discussions of the same issue by incorporating by reference the general discussion in an environmental impact statement of broader scope. For example, a project environmental assessment could be tiered to the Forest Plan EIS.



<b>Timber Production</b>	The purposeful growing, tending, harvesting, and regeneration of trees for industrial or consumer use.
<b>Timber Stand Improvement (TSI)</b>	All noncommercial intermediate cuttings and other treatments to improve composition, condition, and volume growth of a timber stand.
<b>Tongass Timber Reform Act (TTRA)</b>	Tongass Timber Reform Act of 1990. This act requires annual appropriations for timber management on the Tongass National Forest, with a provision providing for the multiple use and sustained yield of all renewable forest resources.
<b>Uneven-age Management</b>	The application or actions needed to maintain high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection.
<b>Utility Volume</b>	Logs that do not meet minimum requirements for sawtimber but are suitable for the production of useable chips.
<b>Value Comparison Unit (VCU)</b>	A distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established to provide a common set of areas for which resource inventories could be conducted and resource value interpretations made.
<b>Viewshed</b>	A distinct area of land visible from identified travelways (boat route, recreation road, or trail) or use areas (recreation cabin or anchorage).
<b>Visual Quality Objective (VQO)</b>	<p>A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.</p> <p><i>Adopted VQO.</i> The VQO to be achieved as a result of management direction identified in the approved forest plan. Adopted VQO's represent the visual resource objective for the Forest Land Management Plan period, normally 10 years. (FSH 2309.22, R-10 Landscape Management Handbook.)</p> <p><i>Retention.</i> Management activities are not evident to the casual Forest visitor.</p> <p><i>Partial Retention.</i> Management activities may be evident, but are subordinate to the characteristic landscape.</p> <p><i>Modification.</i> Management activities may dominate the characteristic landscape but will, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed as middleground (1/4 to 5 miles from viewer.)</p> <p><i>Maximum Modification.</i> Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.</p>
<b>Volume Class (Timber)</b>	<p>Timber volume class is defined by the average timber stand volume, given as thousand board feet per acre. The volume classes where timber harvest is planned in this EIS are:</p> <p><i>Class 4.</i> Stands with 8,000 to 20,000 board feet of timber per acre.</p> <p><i>Class 5.</i> Stands with 20,000 to 30,000 board feet of timber per acre.</p> <p><i>Class 6.</i> Stands with 30,000 to 50,000 board feet of timber per acre.</p> <p><i>Class 7.</i> Stands with over 50,000 board feet of timber per acre.</p>



<b>Volume Strata</b>	Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan.
<b>Wetlands</b>	Areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include muskegs, marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.
<b>Wild and Scenic Rivers (WSR)</b>	<p>Rivers or sections of rivers designated by Congress under the 1968 Wild and Scenic Rivers Act. Wild and scenic rivers may be classified and administered under one or more of the following categories:</p> <p><i>Wild river areas.</i> Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.</p> <p><i>Scenic river areas.</i> Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.</p> <p><i>Recreational river areas.</i> Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.</p>

# Common Acronyms

<b>ANILCA</b>	Alaska National Interest Lands Conservation Act
<b>ASQ</b>	Allowable Sale Quantity
<b>AFHA</b>	Anadromous Fisheries Habitat Assessment
<b>DEIS</b>	Draft Environmental Impact Statement
<b>FEIS</b>	Final Environmental Impact Statement
<b>HSI</b>	Habitat Suitability Index
<b>IDT</b>	Interdisciplinary Team
<b>LUD</b>	Land Use Designation
<b>LTF</b>	Log Transfer Facility
<b>MBF</b>	Thousand Board Feet
<b>MIS</b>	Management Indicator Species
<b>MMBF</b>	Million Board Feet
<b>MMCF</b>	Million Cubic Feet
<b>NEPA</b>	National Environmental Policy Act of 1969
<b>NFMA</b>	National Forest Management Act
<b>OGRs</b>	Old-Growth Habitat Reserves
<b>ROS</b>	Recreation Opportunity Spectrum
<b>TSI</b>	Timber Stand Improvement
<b>TTRA</b>	Tongass Timber Reform Act
<b>VCU</b>	Value Comparison Unit
<b>VQO</b>	Visual Quality Objective
<b>WSR</b>	Wild and Scenic Rivers

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# **Appendix A**

## **Reasons for Scheduling the Environmental Analysis of the Crystal Timber Harvest**



# Appendix A

Reasons for  
Scheduling the  
Environmental  
Analysis of the  
Crystal River  
Harbor

# Reasons for Scheduling the Environmental Analysis of the Crystal Timber Harvest

## I. INTRODUCTION

The following analysis was prepared by the Stikine Area as part of the Position Statement to address whether or not the purpose and need of harvesting 16 MMBF of timber from the Crystal Creek Project Area is a valid and reasonable objective. It has been updated to reflect the changes made by the revised Forest Plan (1997).

To arrive at this volume, it was necessary to answer four different questions. First, how much timber should the Tongass National Forest provide? Second, in the Tongass-wide timber sale program, how much should be produced from the Stikine Area? How should individual timber sale projects be scheduled to achieve the Stikine Area timber sale program objectives? Finally, how does the Crystal Creek Project Area fit into that schedule?

## II. HOW MUCH TIMBER SHOULD BE PRODUCED ON THE TONGASS NATIONAL FOREST?

There are two sources, the Tongass Land and Resource Management Plan (1997) and the Tongass Timber Reform Act (TTRA), that help identifying a Tongass-wide timber sale program level. The values used to arrive at the demand for timber are based on the information from the Forest Plan, Appendix M.

### **Revised Tongass Land Management Plan (1997)**

The main goal for the Tongass Land and Resource Management Plan (1997) is to sustain the diversity, function, and productivity of ecosystems. The desired conditions include natural environments which will provide the essential old-growth forests to sustain viable fish and wildlife populations for continued commercial, sport, and subsistence use and provide outstanding scenery for Forest visitors. The desired condition includes the availability of sawtimber and other wood products on a sustained-yield basis economically efficient to seek to meet the local timber industry demand.

The Allowable Sale Quantity is the maximum quantity of timber that can be harvested on an entire Forest in a decade (36 CFR 219.3). The Revised Forest Plan estimates the average annual Allowable Sale Quantity at 267 MMBF (65 MMCF) of sawtimber and utility volume (Forest Plan, Appendix L).

### **Tongass Timber Reform Act (1990)**

The Tongass Timber Reform Act (TTRA) was enacted modifying management of the Tongass National Forest. The Act was incorporated during the revision of the Forest Plan. TTRA requires the Forest Service to "the extent consistent with providing for multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." The courts have held that this provision of TTRA does not present an absolute requirement for the Forest Service to offer a particular volume of



timber for harvest. This requirement helps to identify a timber harvest program level that could be offered subject to the legal requirements of this and other sections of TTRA and several other laws and the Forest Plan.

#### **Estimation of Demand**

Demand can be estimated by looking at either installed mill capacity or actual historical consumption. Installed mill capacity provides a short term theoretical maximum estimate. Mill capacity is fixed unless facilities expand or new facilities are built. Because some mill capacity may not be presently used due to market demand for the finished product or other conditions, this is a theoretical maximum. Actual consumption is a limited estimate of demand based on historical market conditions. To the extent market conditions change from historical conditions, the actual demand may change. Despite these limitations, these methods provide the best available estimates.

Demand estimates using both installed mill capacity and actual demand are from the Revised Forest Plan. Demand for sawtimber and utility wood based on installed capacity of timber processors in FY 1997 was 495 MMBF with the Wrangell Mill (Forest Plan FEIS, Appendix M). The Wrangell sawmill is currently closed but included in the analysis to reflect potential reopening.

Average annual demand based on estimated consumption ranges from a current possible low of 65 MMBF to an estimated high of 206 MMBF in 2010 (Forest Plan FEIS, Appendix M). This estimate includes consumption by the Wrangell mill. This projection is based on the consideration of changes in the international wood products market, changes in the structure of the Alaska forest products industry, and a continuing changes in the Pacific Northwest and Canada. This projection assumes that the lower grade material previously used for pulp can be exported.

### **III. HOW MUCH OF THE TONGASS WIDE TIMBER SALE VOLUME SHOULD BE PRODUCED ON THE STIKINE AREA?**

Historically, the Stikine's portion of Tongass National Forest timber sale program was 108 MMBF/Year (Tongass Land Management Plan, 1979). Approximately 40 MMBF was scheduled to meet a portion of the Chatham and Stikine Areas' contract commitment for the Alaska Pulp Corporation long-term timber sale (104 MMBF/Year), and 68 MMBF was available for the independent timber sale program.

The Allowable Sale Quantity is the maximum volume that can be harvested, not a future sale level projection and does not reflect all the influences such as market conditions or other resource constraints. The average annual ASQ assigned by the Revised Forest Plan to the Stikine Area is 95 MMBF (23 MMCF). Of the 95 MMBF, 77 MMBF will be on lands that use standard logging system technology. The yearly quantity offered may be more or less than the average for the decade.



#### IV. HOW SHOULD INDIVIDUAL TIMBER SALE PROJECTS BE SCHEDULED TO ACHIEVE THE STIKINE AREA TIMBER SALE PROGRAM OBJECTIVES?

The Stikine Area, along with the Ketchikan and Chatham Areas of the Tongass National Forest, plan timber sale preparation based on a ten year period. This schedule allows the necessary time to complete preliminary analysis, resource inventories, environmental documentation, layout, appraisal, offer and award.

The schedule is reviewed annually. (See Stikine Area Ten Year Sale Schedule, attached.) The schedule lists both the NEPA analyses and sale offerings necessary to achieve a program level of 77 MMBF per year over a ten year period along with the dates for key milestones or "gates" in the sale preparation process. A project completes Gate 2 when environmental analysis is conducted and a decision is signed. Gate 3 represents sale layout, and Gate 5 is the advertisement of the timber sale. An environmental document may cover one or more sales in the ten-year sale plan.

The Stikine Area is approximately 3.8 million acres subdivided into 139 Value Comparison Units (VCUs) which generally represent distinct watersheds. Within each VCU, specific Land Use Designations (LUDs) are identified. Three LUDs designated suitable forest lands as available for timber harvest:

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LUD	Goals
Scenic Viewshed	To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments as seen from the Visual Priority Travel and Use Areas.
Modified Landscape	To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground.
Timber Production	To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs.

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Of the areas that are planned for entry, a relatively small percentage of the total volume available for harvest is scheduled. This strategy for timber harvest scheduling spreads the harvest through time and space to reduce total environmental impacts. For example, the effects to water quality if 50% of a watershed is harvested at once are different than five entries that harvest 10% of the watershed every ten years. By allowing time for recovery and causing less ground disturbance, water quality is less likely to be as affected, but both approaches would harvest the same amount of volume.

The current sale schedule represents one solution to meet program objectives; other solutions are feasible. The timber harvest program does respond to allocating harvest across available lands to balance the need to mitigate impacts and leaves some areas unscheduled to maintain future options.

## **V. HOW DOES THE CRYSTAL CREEK PROJECT FIT INTO THE SCHEDULE?**

The Crystal Creek Study Area is located in Value Comparison Units 487 and 489. VCUs 487 and 489 are allocated Land Use Designations of Scenic Viewshed, Modified Landscape, Special Interest Area, and Old-Growth Habitat.

The current ten year timber schedule was updated in November 1996 and provides for 88 MMBF of timber volume to be offered in Fiscal Year 1999. Part of this volume will be obtained from the Crystal Creek Project Area. The volume is scheduled to be sold in one sale due to costs associated with the log transfer facility reconstruction, new road construction, and possible bridges across the Muddy River. The number and size of sales may vary if there are opportunities for smaller offerings. This will be decided during the update of the sale schedule after the Crystal Creek Record of Decision is completed.

## **VI. CONCLUSION**

Considering the timber harvest program objectives for the Tongass National Forest, and the Stikine Area's contribution to those program objectives, the proposed harvest of 16 MMBF from the Crystal Creek Project Area is reasonable and valid. This volume will contribute to meeting the average annual volume of 77 MMBF; if any less volume is harvested in the Crystal Creek Project Area, either the analysis of another area would need to be completed before scheduled or the volume of an ongoing analysis would need to increase.

# **Appendix B**

## **Unit, Road, Recreation, and Wetland Cards**



# Appendix A

Appendix A contains the following information:

1. A list of the names of the members of the committee.

2. A list of the names of the members of the subcommittee.

3. A list of the names of the members of the working group.

4. A list of the names of the members of the advisory board.

5. A list of the names of the members of the steering committee.

6. A list of the names of the members of the task force.

7. A list of the names of the members of the panel.

8. A list of the names of the members of the committee.

9. A list of the names of the members of the subcommittee.

10. A list of the names of the members of the working group.

11. A list of the names of the members of the advisory board.

12. A list of the names of the members of the steering committee.

13. A list of the names of the members of the task force.

14. A list of the names of the members of the panel.

15. A list of the names of the members of the committee.

# Appendix B

## Unit Cards

### Introduction

The following section discusses the silvicultural prescriptions and the mitigation measures that will be applied for the proposed units. The unit card, which consists of the narrative and map, contains site-specific information for that unit; the silvicultural prescription refers to those in this section plus any site-specific variations needed for that unit.

### Silvicultural Prescriptions

These diagnostic prescriptions have been developed by a silviculturist during the interdisciplinary process to identify possible silvicultural prescriptions for each proposed harvest unit.

#### *Clearcutting With Reserve Trees - Two-aged Management*

Approximately 85% of the basal area (either in groups or individual trees) will be removed, creating a two-layered canopy structure with two or more age-classes. Current silvicultural knowledge suggests the biological rotation length will range from 85 years on highly productive sites to 160 years on low productivity sites. Portions of the Ess Lake viewshed may have the rotation extended to about 165 years to meet visual quality standards.

The main objective is to provide biological and structural diversity in stands by leaving green trees which are not planned to be harvested in the future. Unit boundaries will be located with sensitivity to the resource concerns and mitigating circumstances including visuals, riparian habitat, soil instability, windthrow probability, and wildlife habitat.

Clearcutting results in soil disturbance, providing adequate site conditions for natural regeneration. Spruce and hemlock produce a lot of seeds with excellent seed dispersal. Yellow-cedar reproduction will be monitored to ensure adequate regeneration occurs since yellow-cedar's cone takes two years to mature, and they are relatively slow growers. If units have cedar in them at the time of harvest, cedar interplanting should be considered to ensure species diversity.

The prolific regeneration anticipated following the harvest will need to be thinned approximately twenty years following harvest. Spacing will be approximately 16 feet between trees providing room for diameter growth for the remaining trees. Natural openings, with relatively few trees, may provide sites for preferred wildlife browse since there will be little competition with the trees. Some unthinned microsites (100' diameter) may be distributed throughout the thinned areas to provide cover for wildlife. The thinning will leave dominant trees which are free of insect and disease infestation, as well as, physical deformities such as breakage, forked tops, and stem fluting. Cedar will be favored in the thinning process.



Some stands may require two or more thinnings and possibly prunings to maintain understory for wildlife browse. Tree spacing will be contingent upon the future treatments, i.e. need for additional thinning treatments.

#### *Group Selection - Uneven-aged Management*

Group selection provides a residual tree canopy following harvest which would benefit scenery, wildlife, and soil stability. This system removes trees in groups less than two acres in size and can create a mosaic of irregular openings within the stand. Each opening will regenerate with a uniform age and height; at the end of the rotation, the result will be an uneven-aged stand.

Each group will consist of a mixture of merchantable tree sizes to avoid selecting only the most merchantable trees. Groups of trees infected with dwarf mistletoe will be high priority for harvest.

There were three different group selection prescriptions developed:

- 10% of the basal area removed on each entry, spaced 20 years between entries, usually less than 1 acre in size (200-year rotation). This will emulate gap-phase stand development (small openings created in stands with minimal disturbance when one tree at a time drops from the canopy through blowdown or death).
- 30% of the basal area removed on each entry, spaced 30 to 40 years between entries with 10% reserve trees (90- to 120-year rotation). Groups of trees will usually be 1 to 2 acres in size. Ten percent of the basal area will be retained as reserve trees to more closely emulate old-growth stand characteristics following the final harvest.
- 40% of the basal area removed on the first entry with 30% removed on two subsequent entries, spaced about 30 to 40 years between entries (90 to 120 year rotation). Groups of trees will usually be one to two acres in size. No reserve trees will be retained at the final harvest. This system was designed to make group selection more economical while maintaining old-growth characteristics for the first two entries.

Helicopter, cable, and shovel yarding systems will be used. On helicopter logged units, there will be more flexibility on the position and the shape of the patches. Windthrow may be minimized by designing the patches such that the longest axis of the patch is perpendicular to the dominant wind direction. On units which are to be cable-logged, the distribution and arrangement of the patches will be limited due to the capabilities of the logging equipment. Cable-logged harvest units will be herring-bone patterns with each harvest strip being generally no more than two acres and leave strips between the harvest strips to be harvested in future entries. Shovel logging will be limited to the relatively flat ground. It will provide somewhat more flexibility than cable systems.

As in the clearcutting with reserves prescription, each group of trees will be monitored to ensure adequate restocking of all species to maintain species diversity. Approximately twenty years following harvest, the patches should be considered for potential thinning. Multiple thinnings may be necessary to maintain understory vegetation and develop a multi-storied canopy.



# Legend

- Wilderness
- Old-Growth Habitat
- Special Interest Area (SIA)
- Modified Landscape
- Scenic Viewshed
- Timber Production
- Non-National Forest
- Crystal Creek Project Area Boundary
- Existing System Roads
- Existing Closed Roads
- Shoreline
- Units
- Saltwater
- Log Transfer Facility (LTF)
- 62 Unit Number

Figure B-1  
Proposed Units Land Use Designation







### *Single-Tree Selection - Uneven-aged management*

Within all units except Unit 15, twenty percent of the basal area would be removed in each entry at 40-year cutting cycles by individually selecting trees. The rotation will be extended beyond the average rotation age (90 to 120 years) to 200 years. Because of the difficulty of removing individual trees, this prescription can be only used where shovel yarding is possible. This prescription maximizes old-growth structural diversity while harvesting timber.

Due to the relatively small openings created by single-tree selection, regeneration and individual tree growth will be somewhat suppressed. Cedar, hardwoods, and the understory herbaceous species, in particular, will likely be suppressed more so than hemlock and spruce. Regeneration will be closely monitored to ensure the cedar component is maintained through the next rotation. Thinning will be unlikely in single-tree selection stands.

Unit 15 is proposed for a experimental single-tree selection. One fourth of the unit will be established as a control. The other part will be divided into three sections and harvested at 20%, 40%, and 60% removal of the basal area respectively. The previously harvested personal-use timber will be included when calculating the basal area to be removed. The primary objective is to study the effects of varying intensities of single tree harvest on moose and deer winter use of the stand. This is an expansion of the administrative study in another area where 20% and 40% of the basal area of old-growth stands had been removed to study ungulate use. Subsequent entries will be contingent upon the results of the administrative study, e.g. if 40% removal appears to be the optimal habitat, future management strategies for the sub-units with 20% and 60% removal will be modified to emulate the 40% strategy. Shovel-yarders will be utilized in this harvest.

## **Archaeology**

As directed in the Heritage Resources Forest-wide Standards and Guidelines, if a site is discovered during project implementation, work shall be suspended by the layout forester or sale administrator to avoid potential site damage. The Forest or District Archaeologist shall be notified to assess site significance and consider eligibility status to the National Register of Historic Places. The Forest Supervisor shall notify the State Historic Preservation Office and authorize resumption of work only after the consultation process has been completed. The sale administrator shall keep the contractor informed of anticipated delays in work resumption.

## **Scenery**

### **Scenic Viewshed**

The primary scenic objective in implementing timber harvest within the Scenic Viewshed Land Use Designation is to retain a natural-appearing landscape over time, as viewed from Visual Priority Travel Routes and Use Areas. Within these viewsheds, timber harvest units are typically small and affect only a small percentage of the seen area. Areas topographically screened from Visual Priority Travel and Use Areas may be heavily modified.

The scenic requirements are accomplished by applying the Adopted Visual Quality Objectives of Retention in the Foreground viewing area, and Partial Retention within the Middleground and Background viewing area. In those areas not visible from Visual Priority Travel Routes and Use Areas, the Maximum Modification VQO would be applied.

Techniques and mitigation to achieve these objectives may include, but are not limited to: silvicultural treatment, unit size, allowable cumulative visual disturbance, green tree retention, visual screening, and boundary modification.



## **Modified Landscape**

The primary scenic objective in implementing timber harvest within the Modified Landscape Land Use Designation is to minimize development in the near viewing area while allowing a sustained yield of timber and mix of other resource activities in other viewing areas over time.

The scenic requirements are accomplished by applying the Adopted Visual Quality Objectives of Partial Retention within the Foreground viewing area, while the Modification VQO is applied in the Middleground/Background distance zones as viewed from Visual Priority Travel Routes and Use Areas. The Maximum Modification VQO is applied to all other locations.

Techniques and mitigation to achieve these objectives is similar to those applied within the Scenic Viewshed Land Use Designation.

## **Soil and Water**

All known Class I, II, and III streams are shown on the unit card maps. The location of existing roads and approximate location of proposed roads is also shown. Class IV streams needing protection during harvest activities and site specific locations of steep potentially unstable soils are being located during field surveys. These features will be shown on the unit card maps in the final environmental impact statement. Some trees will be retained along sensitive Class IV streams and where small areas of steep potentially unstable soils are located within units. Where clearcuts with reserves harvest is used, fifteen percent of the stand volume will be retained. Group selection harvest would retain from 60 percent to 90 percent of the trees within the unit.

## **Wildlife**

This section describes mostly wildlife concerns that are common to all units. Concerns that are specific to certain units are discussed in the individual unit cards.

### **Raptor and Great Blue Heron Nests**

All timber harvest units in the proposed action will be searched for raptor and heron nests prior to implementation. If nests are found, habitat buffers will be established around the nests in accordance with Forest Plan Standards and Guidelines to protect the nest sites. Timing restrictions will be placed on activities around the nests during active nesting and fledging periods to minimize disturbance to the birds using the nests. Standards used to protect nest sites vary depending on the type of nest located. For all confirmed active hawk, owl, or great blue heron nests (except osprey and goshawk), a 600-foot forested windfirm buffer will be established around the nest. New road construction will not be allowed within the nest habitat buffer unless no other reasonable road alternatives exist outside the buffer. Activities that are likely to result in nest abandonment will not be permitted within 600 feet of an active nest during the nesting period (generally March 1 to August 15). The no-activity buffer may be increased if field conditions indicate that more restrictions are necessary to minimize nest disturbances. Heron and hawk nests will be monitored for use for at least two years after discovery. If the nest sites are shown to be inactive for two consecutive years, the nest buffer protection may be removed.

For all confirmed or probable goshawk nests, a minimum of 100 acres of productive old-growth around the site will be maintained as nesting habitat. New road construction will not be allowed within this area unless no other reasonable road alternatives exist. Activities that are likely to result in nest abandonment will not be permitted within 600 feet on an active nest from March 15 to August 15. Nest habitat protection measures will be maintained but timing restrictions will be removed if nests become inactive.

For all confirmed osprey nests, a minimum 330-foot habitat management area will be established around each nest tree. The exact boundary will be based on local topography, timber type, a reasonable assurance of windfirmness, and other factors. Timber harvest within the osprey nest zone will be designed to maintain the windfirmness of nest and reserve trees. Trees retained within the nest area will include the nest tree, a minimum of three of the largest broken-top trees or snags for alternative nest trees, a minimum of eight dominant or co-dominant trees with large branches suitable for perching, and a minimum of 24 subdominant live trees for future nest and perch sites. Trees that are known to be used by osprey for perching should be selected for retention as perch trees. Activities that are likely to result in nest abandonment will not be permitted within 600 feet of an active nest from April 15 to August 31. The no-activity buffer and timing restriction period may be increased if field conditions indicate that more restrictions are necessary to minimize nest disturbances. Nest habitat protection measures will be maintained but timing restrictions will be removed if nests become inactive.

### **Waterfowl Nesting and Brood-Rearing**

Wetlands that are known or likely to be used by waterfowl for nesting, brooding, and rearing have been identified. Buffers of 330-foot width have been placed around these wetlands. Within this buffer, harvest is generally limited to single tree-selection of 40% or less, group selection harvest of 0.5 acre or less, and salvage logging of downed trees. Timing clauses have been placed on these buffers to restrict logging and roading activities during the period April 1 to July 31. Some large-diameter live trees may be topped within the units to provide for future nest sites. Snags and dying trees will be emphasized for retention of reserve trees.

### **Loss of Old-Growth Habitat**

Loss of old-growth habitat is a wildlife concern for most of the proposed harvest units. This concern is mitigated within the project area by the retention of old-growth reserves, beach-fringe and riparian buffers and by old-growth habitat classed as unsuitable. Other methods to mitigate against the loss of old-growth habitat include single-tree selection harvest, group-selection harvest, and retaining reserve trees within clearcut harvest units.

Single-tree selection harvest will generally remove only 20% of the existing stands and leave all age and size of trees within the resultant stand. Evidence of such harvesting practices within the project area suggest that old-growth dependent wildlife species will find suitable habitat after logging.

Group-selection harvest reduces the size of the harvested opening to two acres or less and maintains old-growth habitat next to the harvested opening. This harvest method attempts to mimic blowdown. As a whole, the stand should provide some habitat for old-growth species.

Within clearcut with reserves harvest units, 10%-20% of the stand will be left as reserve trees to preserve some old-growth legacy. Reserve trees will include all age and size of trees with emphasis on snags and dying trees for snag recruitment. Trees retained should have reasonable assurance of windfirmness.



**Crystal Creek Unit Card**

**Unit 1**

Acres: 33      Alternative (s): 5  
1977 Aerial Photo: Flight #: 50

MBF Volume: 185  
Photo #: 9

MCF Volume : 47

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting occurs within or adjacent to unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling, yarding, and road construction within the unit during the period of April 1 to July 31.

**Fisheries**

Concern: Class I lakes north and west of the unit.

Mitigation: No programmed timber harvest within 100 horizontal feet of lake margin or within the Riparian Management Area [greatest extent of riparian vegetation or soils or slope break (whichever is greatest)].

**Silvicultural Prescription**

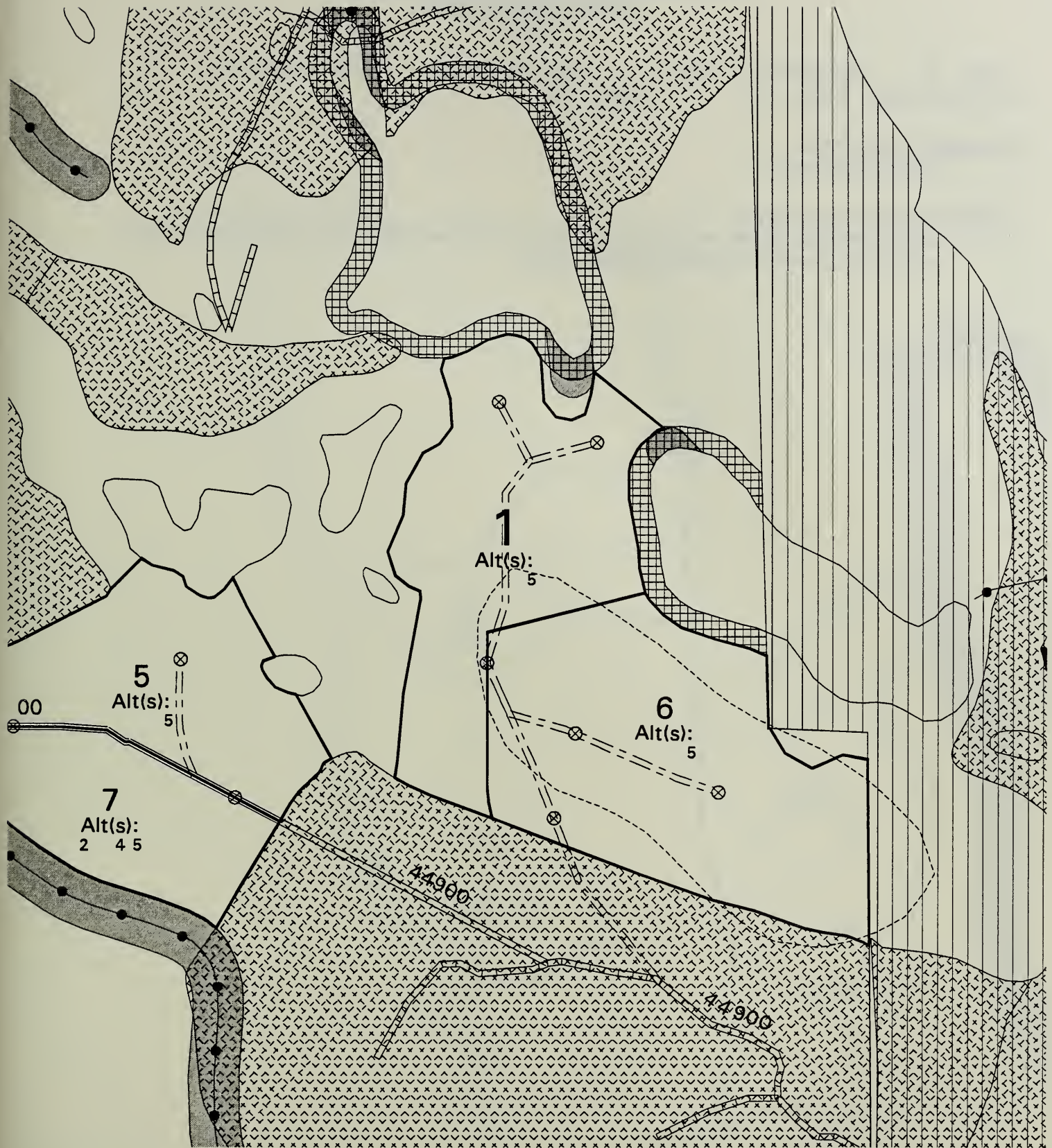
Single-tree selection - 20% removal.

**Logging System and Unit Design**

The north and west boundary follows slope breaks plus 100 feet for Class I lakes. The east boundary is common with unit 6 and the south boundary follows a managed stand. This unit is planned for shovel logging to minimize soil disturbance and meet silvicultural prescription.



# Crystal Creek Timber Harvest Unit 1



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

**Crystal Creek Unit Card**  
**Unit 2**

Acres: 19      Alternative (s): 2 and 4      MBF Volume: 242      MCF Volume : 79  
1977 Aerial Photo: Flight #: 49      Photo #: 152

**Silvicultural Prescription**

Clearcut with reserves.

**Logging System and Unit Design**

The unit boundary follows muskeg edges on the west and a Road 44900 on the east. Shovel logging is appropriate to meet unit objectives with a short spur.

# Crystal Creek Timber Harvest Unit 2



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |





**Crystal Creek Unit Card**

**Unit 3**

Acres: 29      Alternative (s): 2, 4, and 5

MBF Volume: 394

MCF Volume : 126

1977 Aerial Photo: Flight #: 49

Photo #: 152

**Silvicultural Prescription**

Clearcut with reserves.

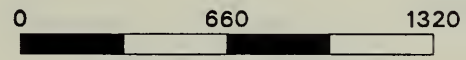
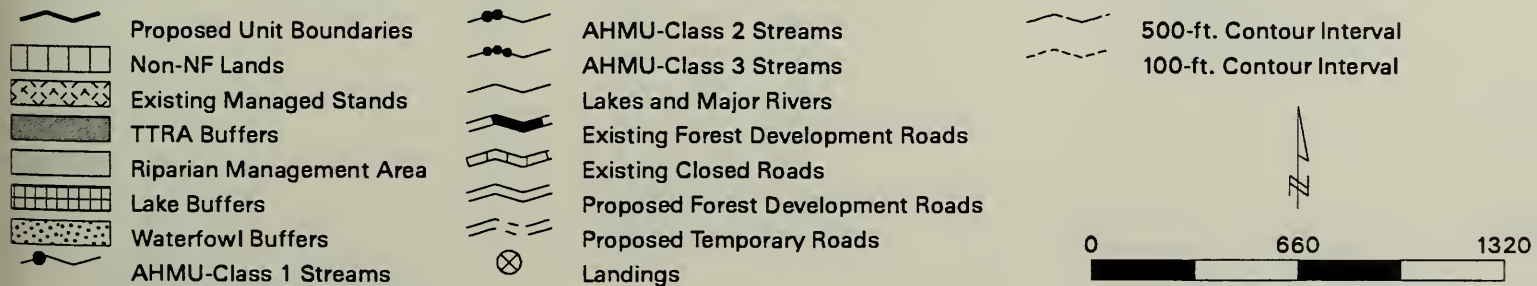
**Logging System and Unit Design**

The north boundary follows Road 44900. The rest of the boundary follows a muskeg fringe. A short spur is required to minimize shovel logging distances.

# Crystal Creek Timber Harvest Unit 3



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Scale is 1 inch = 660 feet

## **Crystal Creek Unit Card**

### **Unit 4**

Acres: 35      Alternative (s): 2 and 4  
1977 Aerial Photo: Flight #: 49

MBF Volume: 434  
Photo #: 152

MCF Volume : 139

### **Resource Concerns and Mitigation**

#### **Fisheries**

Concern: Class II stream is located at the north end of the unit.

Mitigation: Maintain riparian management area of 120 feet which includes a no harvest a 100 foot TTRA buffer.

#### **Silvicultural Prescription**

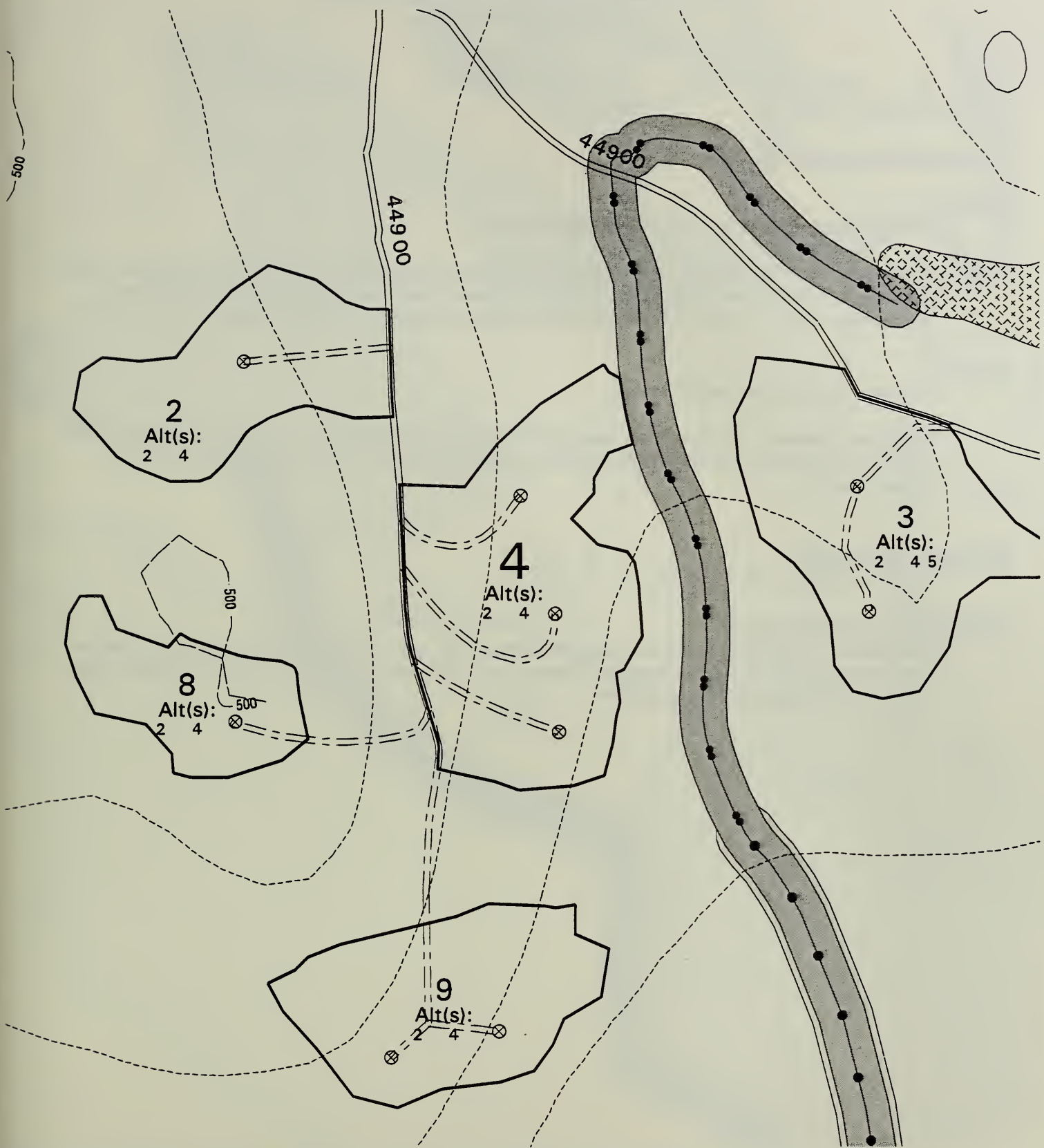
Clearcut with reserves

#### **Logging System and Unit Design**

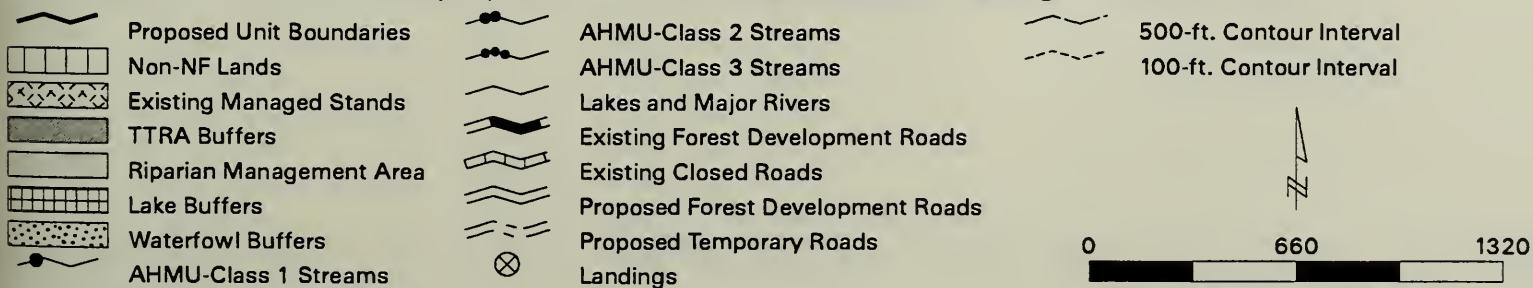
The east boundary follows a muskeg fringe; the west boundary follows the road. The north and south boundaries follow logical yarding boundaries. Three spurs will be required for a combination of shovel and cable logging.



# Crystal Creek Timber Harvest Unit 4



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 5**

Acres: 26      Alternative (s): 5  
1977 Aerial Photo: Flight #: 49

MBF Volume: 114  
Photo #: 152

MCF Volume : 30

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting occurs within or adjacent to unit.

Mitigation: Single tree selection. A waterfowl timing clause will prohibit timber harvest and temporary road construction within the unit from April 1 to July 31 to protect goose nesting and fledging. A construction timing clause, April 1 to June 30, on Road 44900, adjacent to the unit, will protect goose nesting.

**Fisheries**

Concern: Class I stream west of the unit.

Mitigation: Maintain a 100 foot no-cut commercial timber harvest buffer and a no programmed commercial timber harvest area to the greatest of the flood plain, riparian vegetation or soils, or riparian associated wetland fens.

**Silvicultural Prescription**

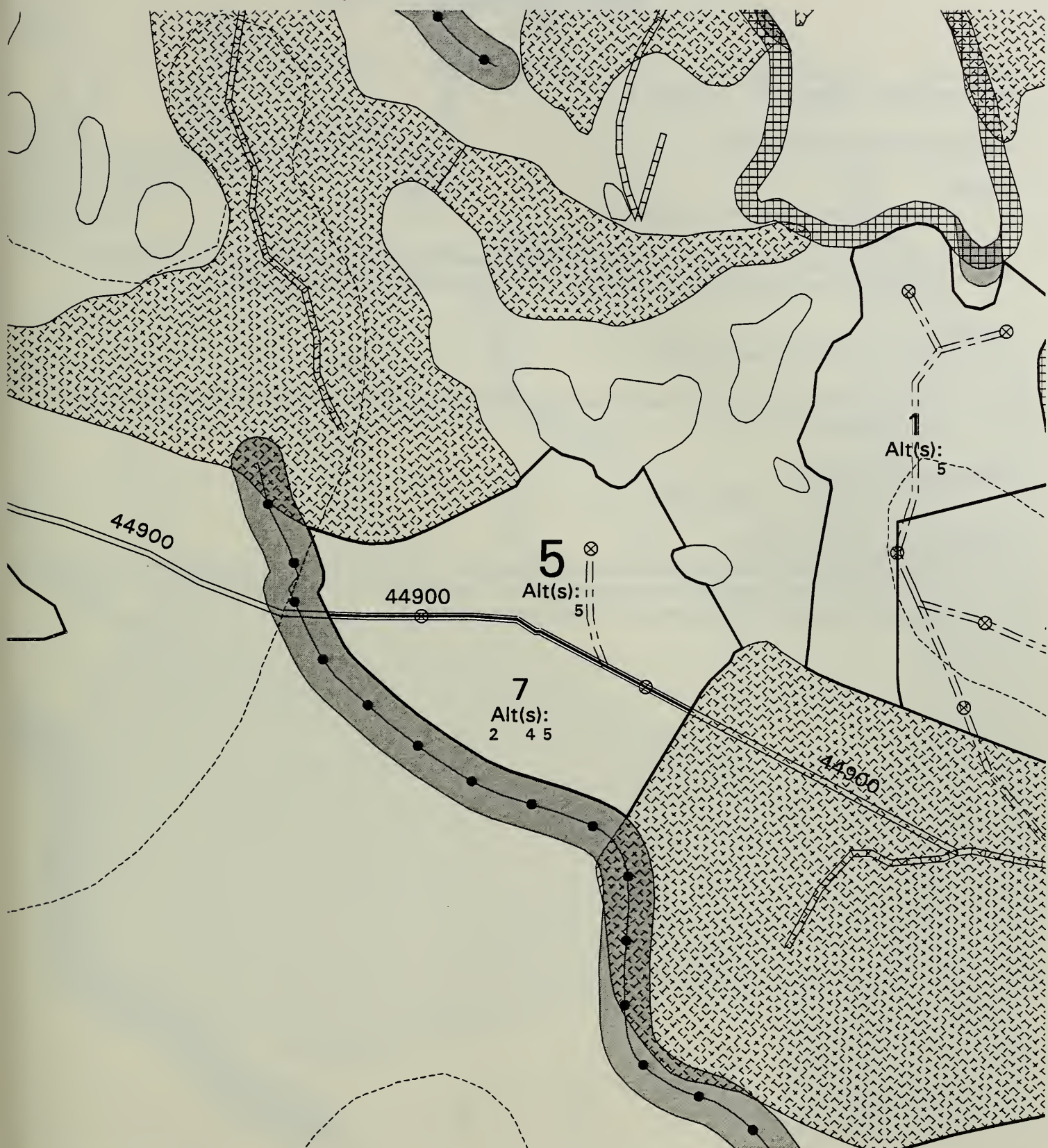
Single tree selection - 20% removal

**Logging System and Unit Design**

Unit boundary follows a managed stand and small lakes to the north and east, maintain adequate windfirm buffer along lakes. The southern boundary follows Road 44900. A combination of shovel and cable yarding will be used. A short spur will be required.



Crystal Creek Timber Harvest Unit 5



1  
Alt(s):  
5

5  
Alt(s):  
5


7  
Alt(s):  
2 4 5

44900

44900

44900

Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |   |                                   |   |                          |
|--|--------------------------|---|-----------------------------------|---|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |   |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |   |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |   |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |   |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |   |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |   |                          |
- 0 660 1320





**Crystal Creek Unit Card**

**Unit 6**

Acres: 42      Alternative (s): 5      MBF Volume: 235      MCF Volume: 59  
1977 Aerial Photo: Flight #: 50      Photo #: 9

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting occurs within unit.

Mitigation: Single tree selection. A waterfowl timing clause will prohibit road construction, timber harvest and other harvest activities from April 1 to July 31, to protect goose nesting and fledging.

**Fisheries**

Concern: Class I lake north of unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management area (at least 100 horizontal feet).

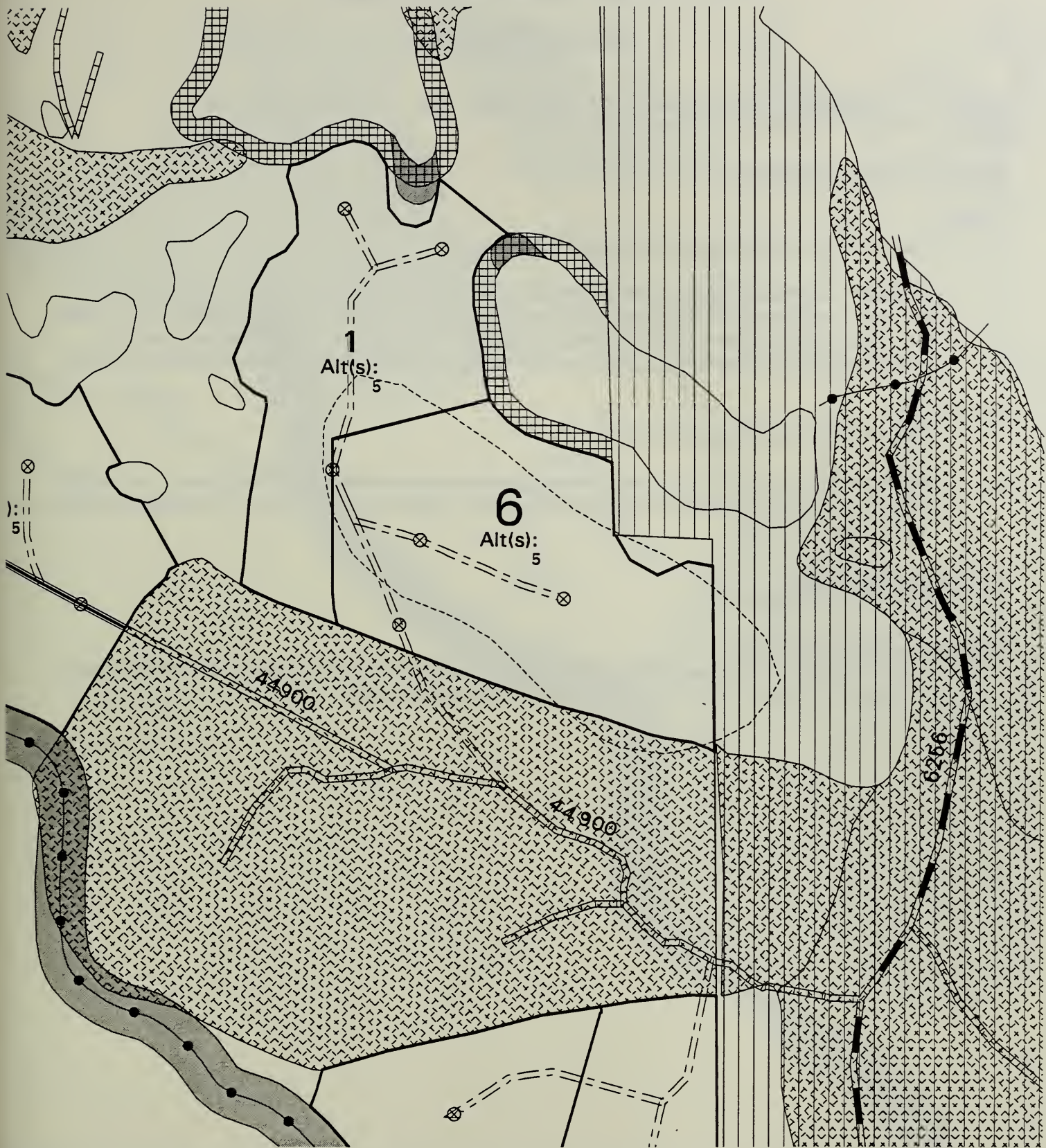
**Silvicultural Prescription**

Single tree selection - removal 20%.

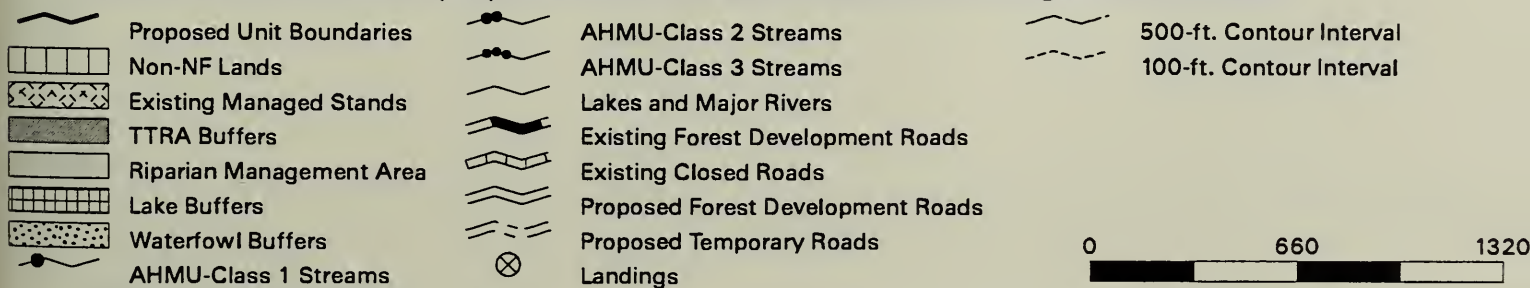
**Logging System and Unit Design**

The north boundary follows a slope break along a lake buffer. The east boundary follows non-National Forest Land, and the south boundary follows a managed stand. The west boundary is common with Unit 1. Shovel logging is the preferred harvest method to meet resource concerns.

# Crystal Creek Timber Harvest Unit 6



Alternatives that include the proposed units are listed beneath the larger unit numbers.





## **Crystal Creek Unit Card**

### **Unit 7**

Acres: 19      Alternative (s): 2, 4, and 5      MBF Volume: 428      MCF Volume: 112  
1977 Aerial Photo: Flight #: 49      Photo #: 152

#### **Resource Concerns and Mitigation**

##### **Wildlife**

Concern: Goose nesting occurs within or adjacent to the unit.

Mitigation: A waterfowl timing clause will prohibit timber harvest within the unit from April 1 to July 31, and road construction of 44900, adjacent to the unit, from April 1 to June 30 to protect possible goose nesting use. Loss of goose habitat within the unit will be mitigated by the riparian management area and by the retention of snags and reserve trees. Some live spruce may be topped to provide nesting platforms for geese.

##### **Fisheries**

Concern: Class I stream to west of the unit.

Mitigation: Maintain a 100 foot no-cut commercial timber harvest buffer and a no programmed commercial timber harvest area to the greatest extent of the flood plain, riparian vegetation or soils, or riparian associated wetland fens.

#### **Silvicultural Prescription**

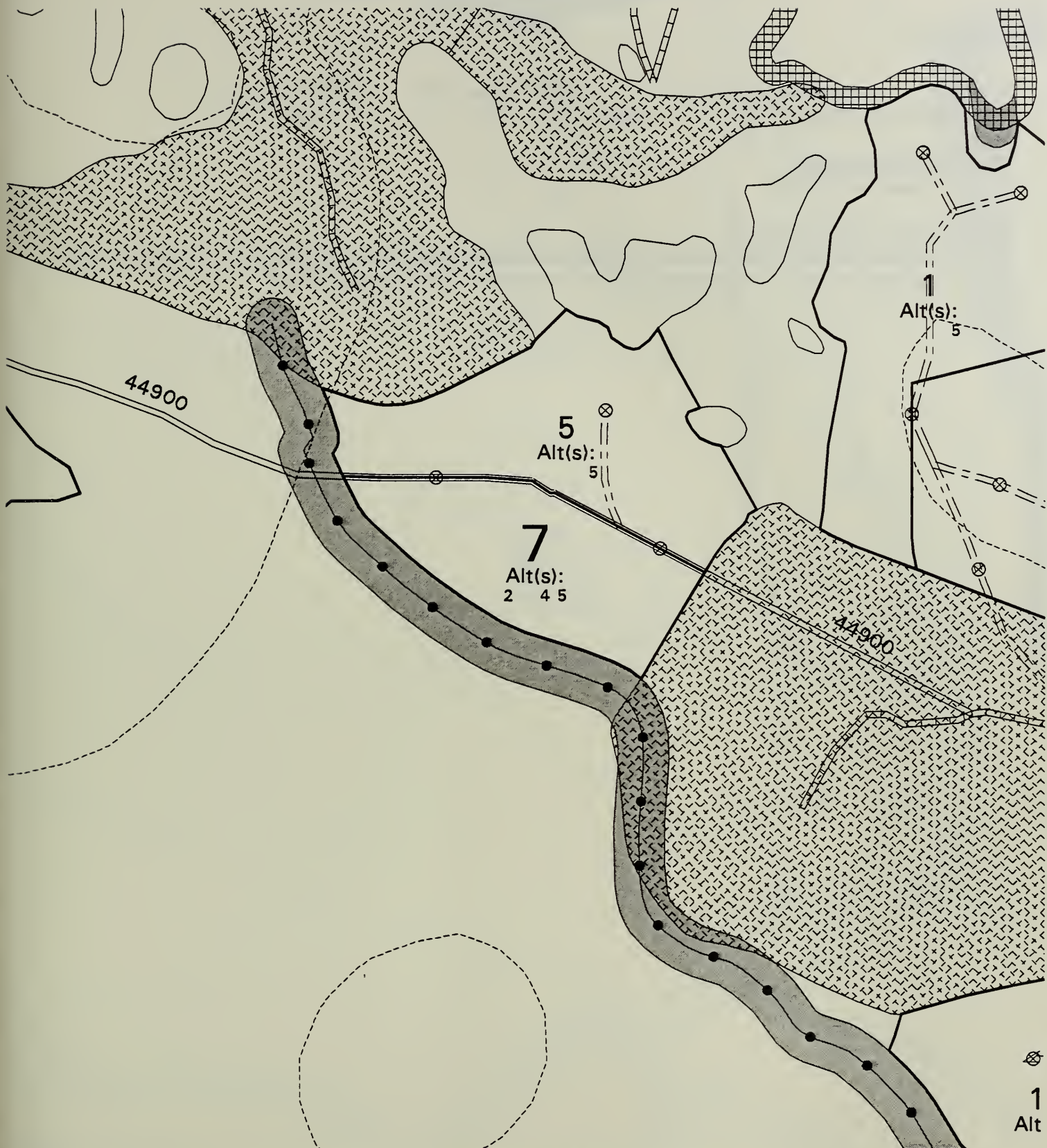
Clearcuts with reserves

#### **Logging System and Unit Design**

The unit boundary follows Road 44900 to the north; a stream is the southern boundary, and a managed stand is the eastern boundary. Shovel logging is the prescribed harvest system.



# Crystal Creek Timber Harvest Unit 7



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

**Crystal Creek Unit Card**  
**Unit 8**

Acres: 12      Alternative (s): 2 and 4      MBF Volume: 143      MCF Volume : 48  
1977 Aerial Photo: Flight #: 49      Photo #: 152

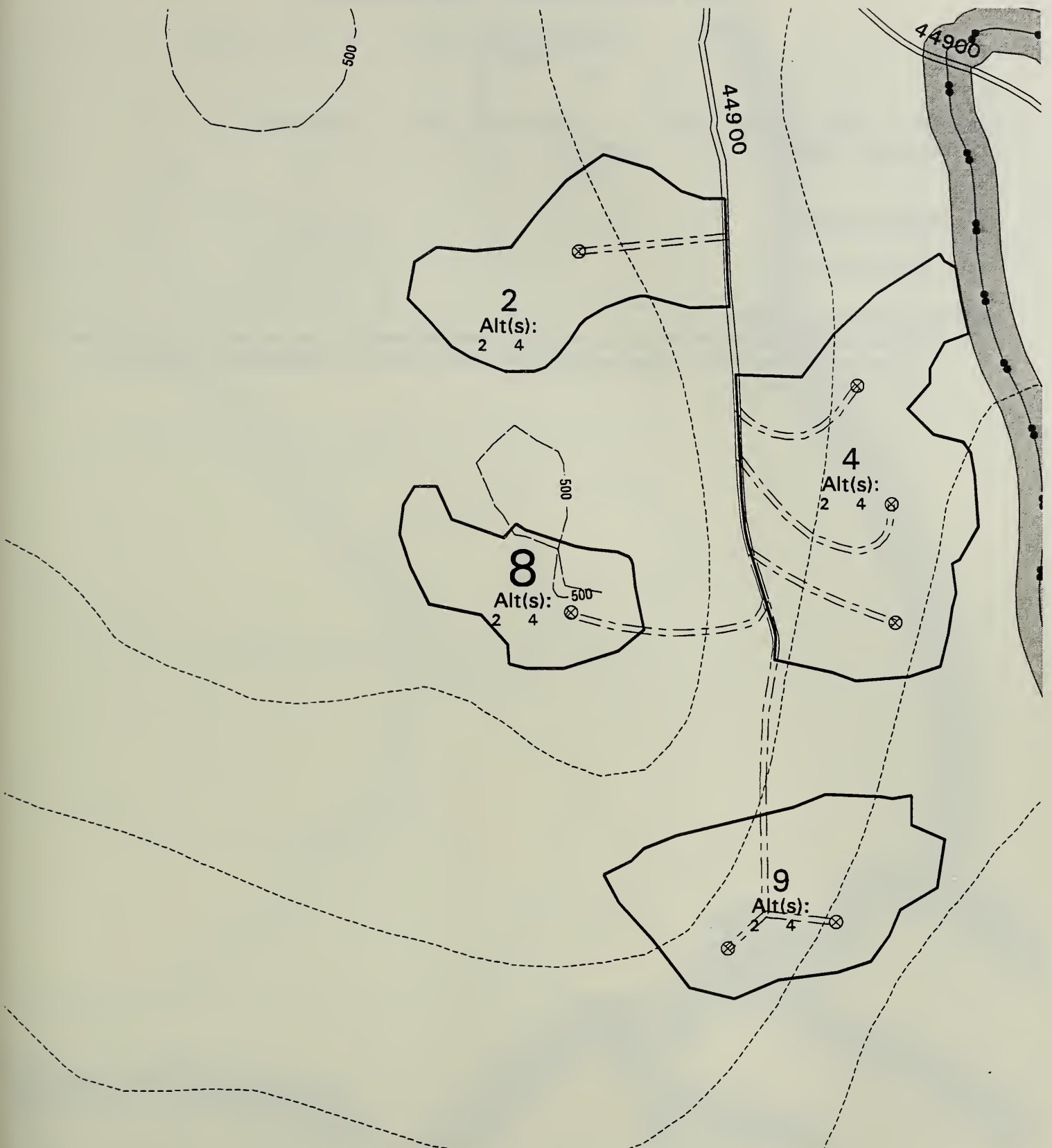
**Silvicultural Prescription**

Clearcut with reserves

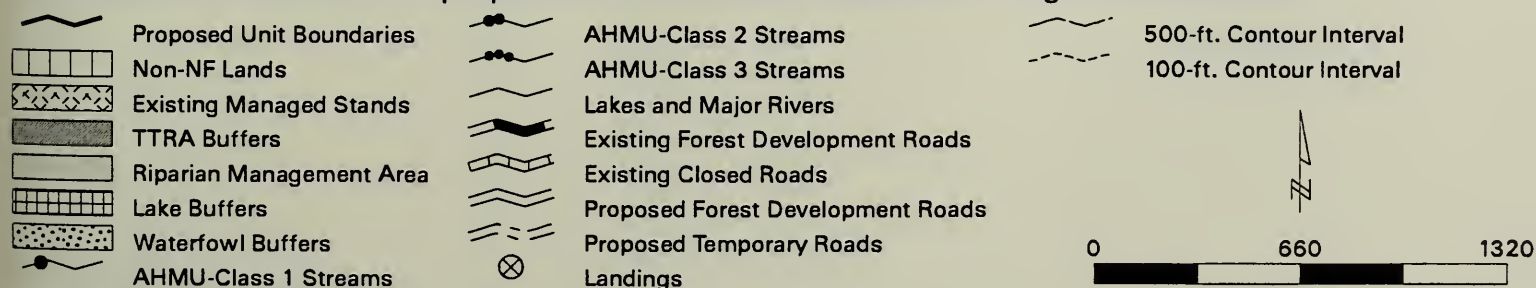
**Logging System and Unit Design**

The unit boundary follows muskeg fringe on the north and west sides, and logical yarding boundaries on the south and east sides. A short spur is required to minimize shovel logging distances.

# Crystal Creek Timber Harvest Unit 8



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 9**

Acres: 22      Alternative (s): 2 and 4      MBF Volume: 262      MCF Volume : 88  
1977 Aerial Photo: Flight #: 49      Photo #: 152

**Silvicultural Prescription**

Clearcut with reserves

**Logging System and Unit Design**

The unit boundary follows muskeg fringe on the east, south and west sides with the north boundary following a logical yarding boundaries. A short spur with a fork will be required to accommodate a combination of shovel and cable yarding.

# Crystal Creek Timber Harvest Unit 9



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

**Crystal Creek Unit Card**  
**Unit 10**

Acres: 58      Alternative (s): 4 and 5      MBF Volume: 331      MCF Volume: 84  
1977 Aerial Photo: Flight #: 50      Photo #: 8

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely to occur within or adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling, yarding, and road construction within the unit during the period of April 1 to July 31.

**Fisheries**

Concern: Class I stream to the west of the unit.

Mitigation: Maintain a 100 foot no-cut commercial timber harvest buffer and a no programmed commercial timber harvest area to the greatest extent of the floodplain, riparian vegetation, or soils, or riparian associated wetland fens.

**Silvicultural Prescription**

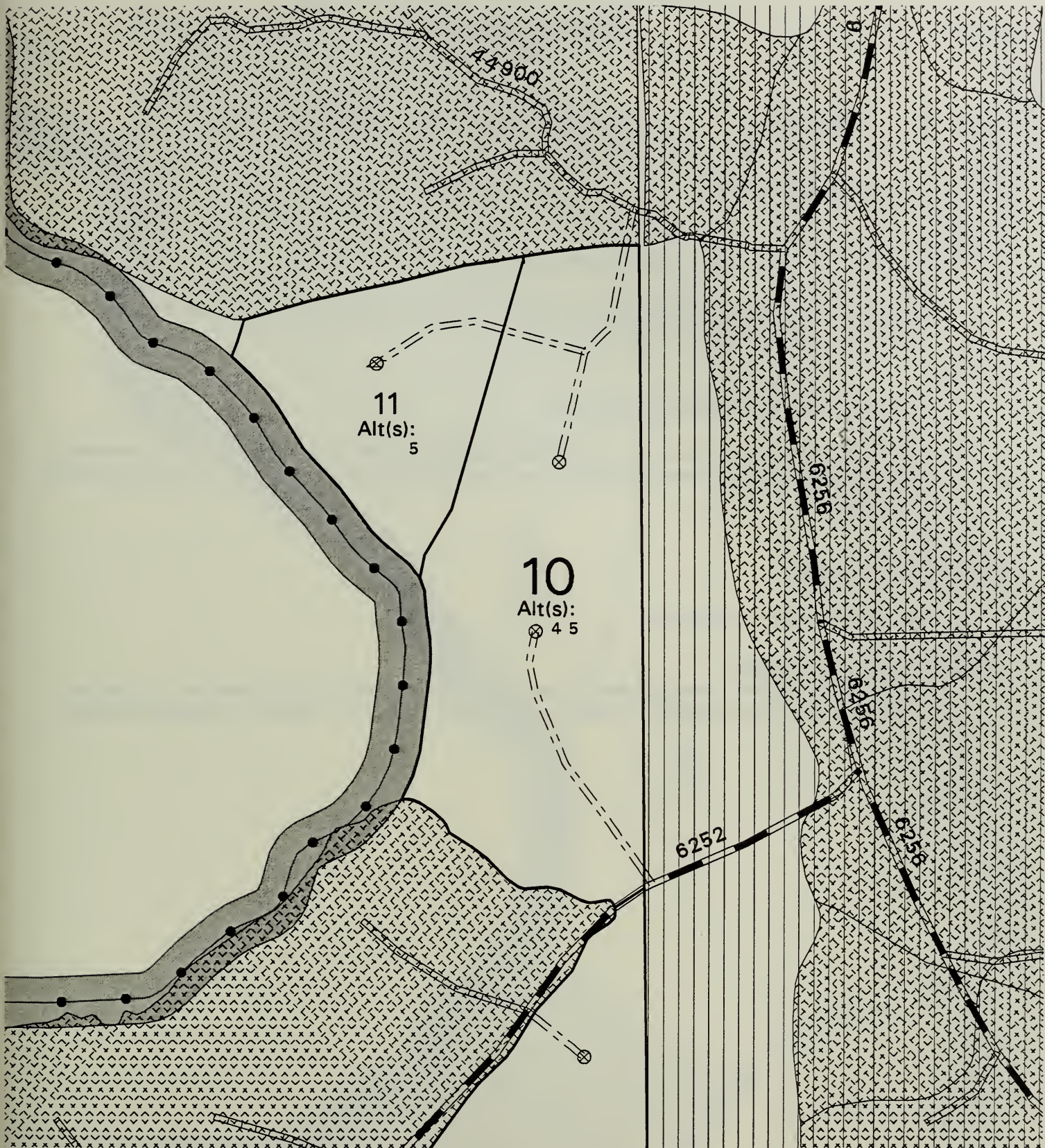
Single-tree Selection - 20% removal

**Logging System and Unit Design**

The north and south boundary is bordered by managed stands; the west boundary follows a Class I stream and a common boundary with Unit 11. The east boundary follows non-National Forest Lands. Two spurs are required to minimize shovel yarding distances.



# Crystal Creek Timber Harvest Unit 10



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320  
Scale is 1 inch = 660 feet

**Crystal Creek Unit Card**  
**Unit 11**

Acres: 24      Alternative (s): 5  
1977 Aerial Photo: Flight #: 50

MBF Volume: 110  
Photo #: 8

MCF Volume : 29

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely to occur within or adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling, yarding, and road construction within the unit during the period of April 1 to July 31.

**Fisheries**

Concern: Class I stream to the west of the unit.

Mitigation: Maintain a 100 foot no-cut commercial timber harvest buffer and a no programmed commercial timber harvest area to the greatest extent of the flood plain, riparian vegetation, or soils, or riparian associated wetland fens.

**Silvicultural Prescription**

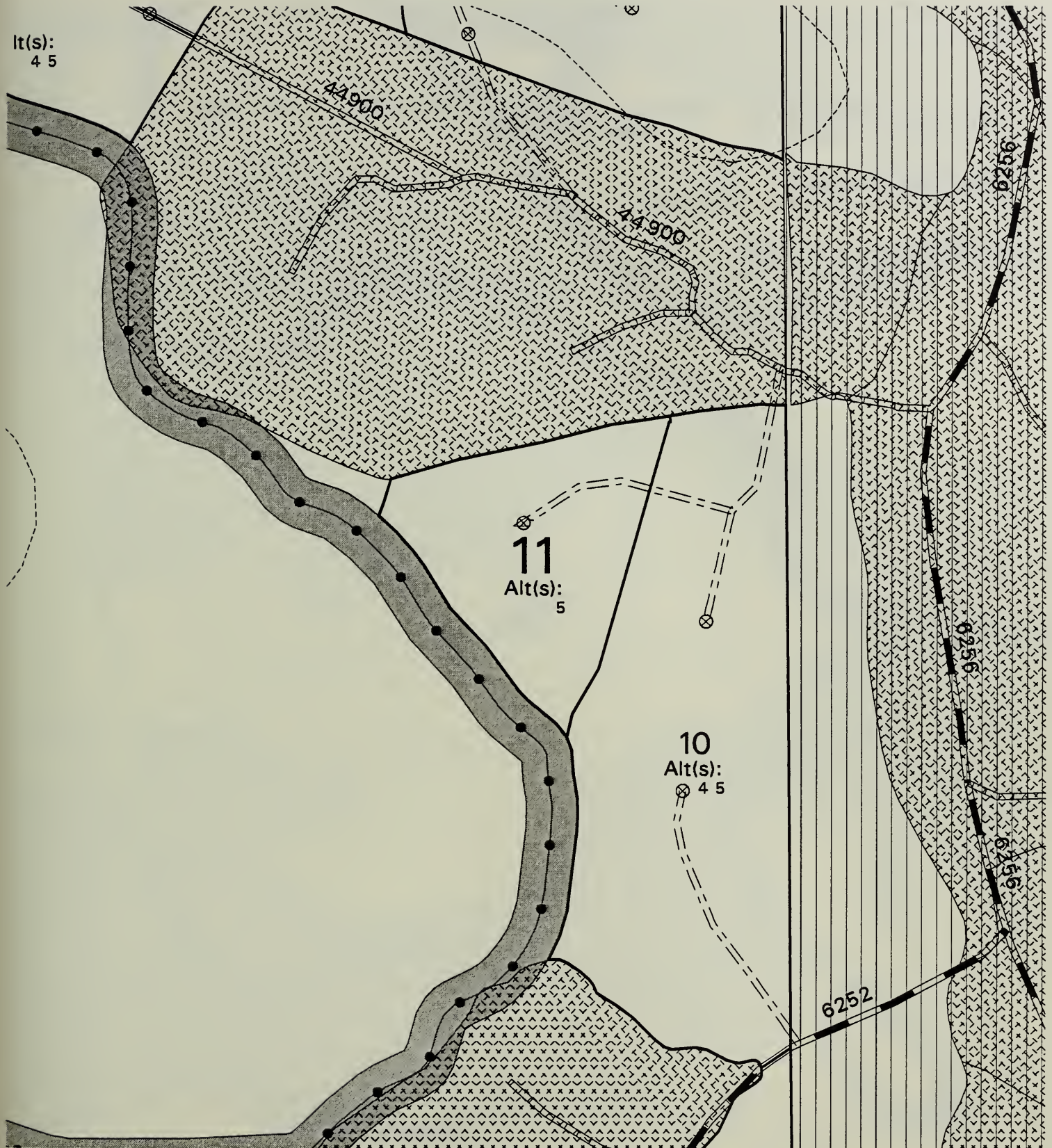
Single-tree Selection - 20% removal

**Logging System and Unit Design**

The unit boundary follows a managed stand to the north; shares a common boundary with unit 10 to the east and follows a Class I stream buffer to the west. A short spur is necessary to minimize shovel yarding distance.



# Crystal Creek Timber Harvest Unit 11



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320

Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 12**

Acres: 14      Alternative (s): 2, 3, 4, and 5      MBF Volume: 125      MCF Volume : 32  
1977 Aerial Photo: Flight #: 49      Photo #: 155

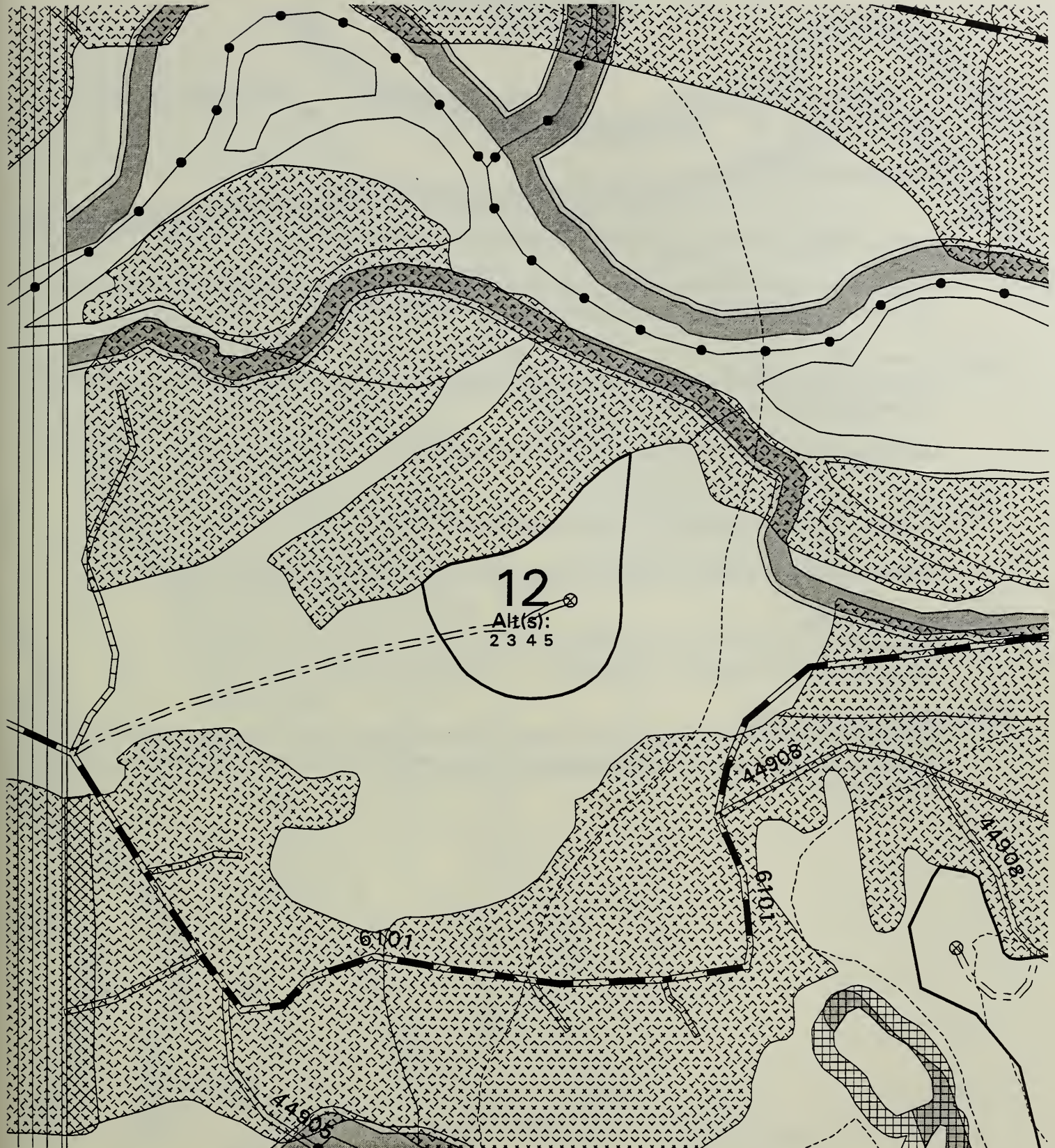
**Silvicultural Prescription**

Single-tree Selection - 20% removal

**Logging System and Unit Design**

The unit boundary follows a managed stand to the north and topographic features (uplifted river terrace) on the east, west, and south boundaries. Shovel logging is the preferred yarding method.

# Crystal Creek Timber Harvest Unit 12



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 13**

Acres: 27      Alternative (s): 3 and 5      MBF Volume: 227 and 302      MCF Volume : 59 and 79  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation:**

**Scenery**

Concern: Upper portion of unit visible from Thomas Bay and Frederick Sound.

Mitigation: Designed as a partial harvest. Use group selection harvest method to minimize harvest openings at the north and northeast end of unit beyond the ridge line to less than 1 acre.

**Landslide Prone Soils**

Concern: Approximately 5 acres of isolated areas of steep slopes are located in the south-central portion of the unit (west facing backslope, separated by a bench).

Mitigation: Retain some trees in this area to maintain slope stability.

**Hydrology**

Concern: Small class IV stream located in the southwest portion of unit.

Mitigation: Maintain partial log suspension when yarding over stream to maintain channel stability.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 3)

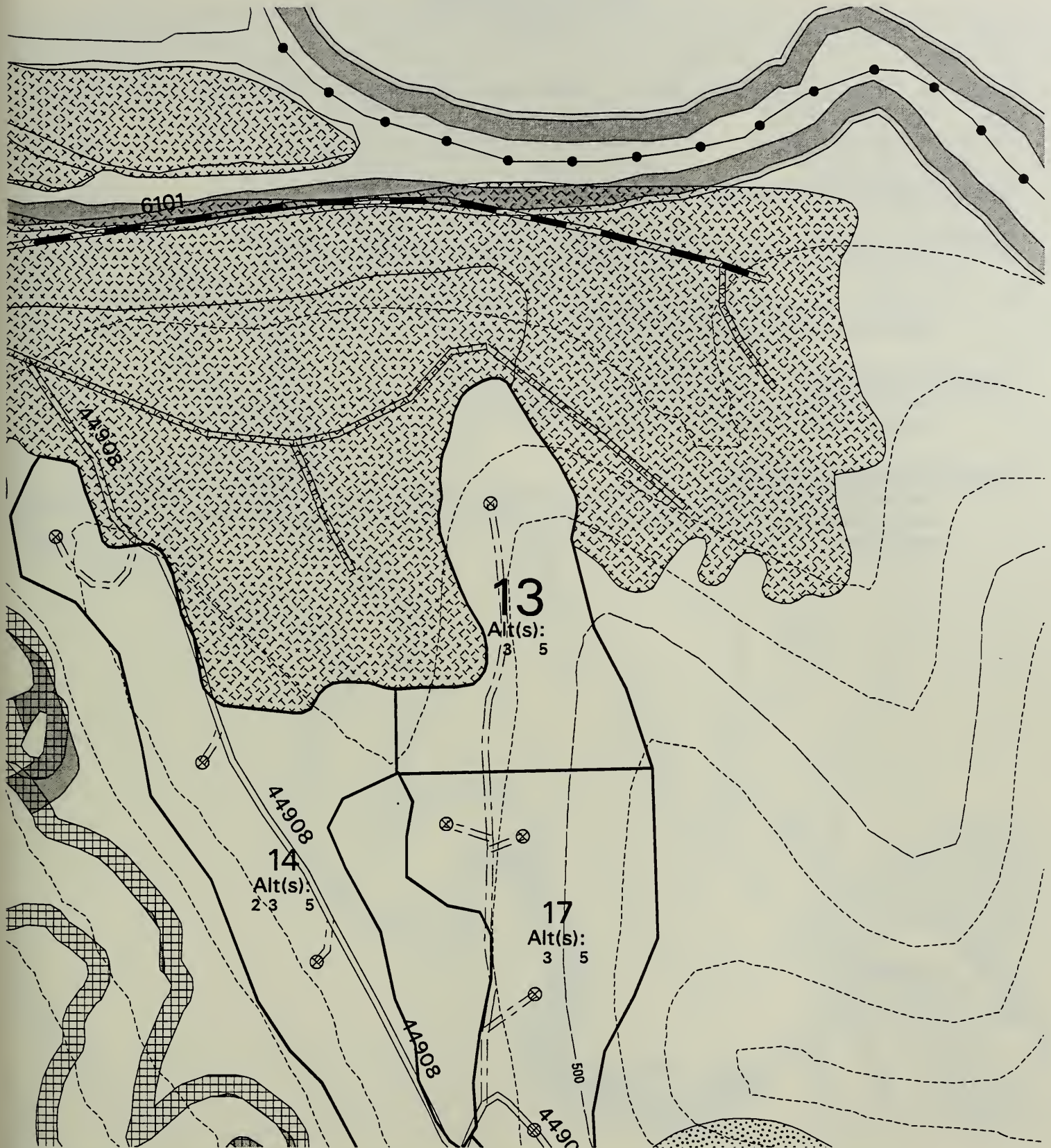
Group Selection - 40% removal (Alternative 4)

**Logging System and Unit Design**

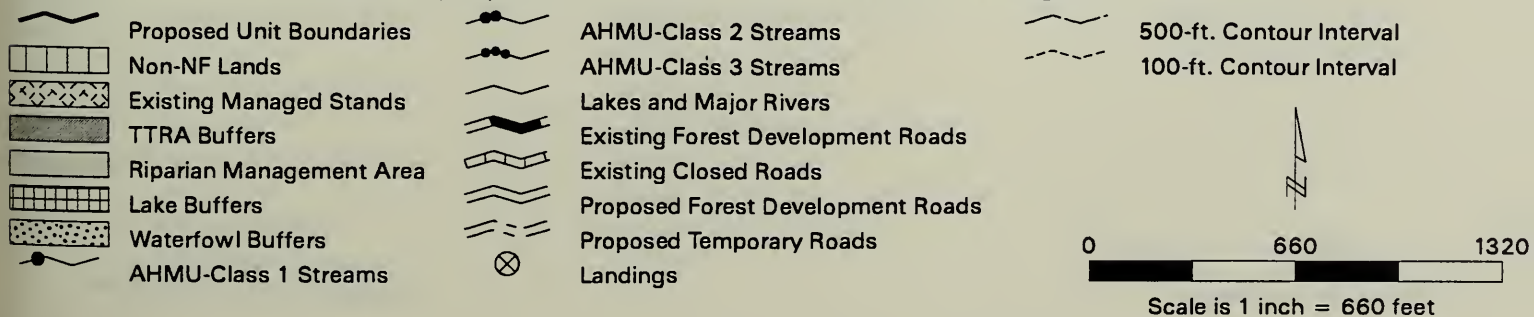
The unit boundary follows slope breaks along managed stands and contour breaks along the west and east boundaries. Short spur is required. Cable logging will be the primary logging system with shovel logging next to the road.



# Crystal Creek Timber Harvest Unit 13



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 14**

Acres: 54      Alternative (s): 2, 3, and 5      MBF Volume: 445, 445 and 594      MCF Volume : 114, 114 and 153  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the southern portion of the unit.

Mitigation: Use group selection harvest method. Prohibit tree falling and yarding in southern 20% of the unit during the period of April 1 to July 31.

**Silvicultural Prescription**

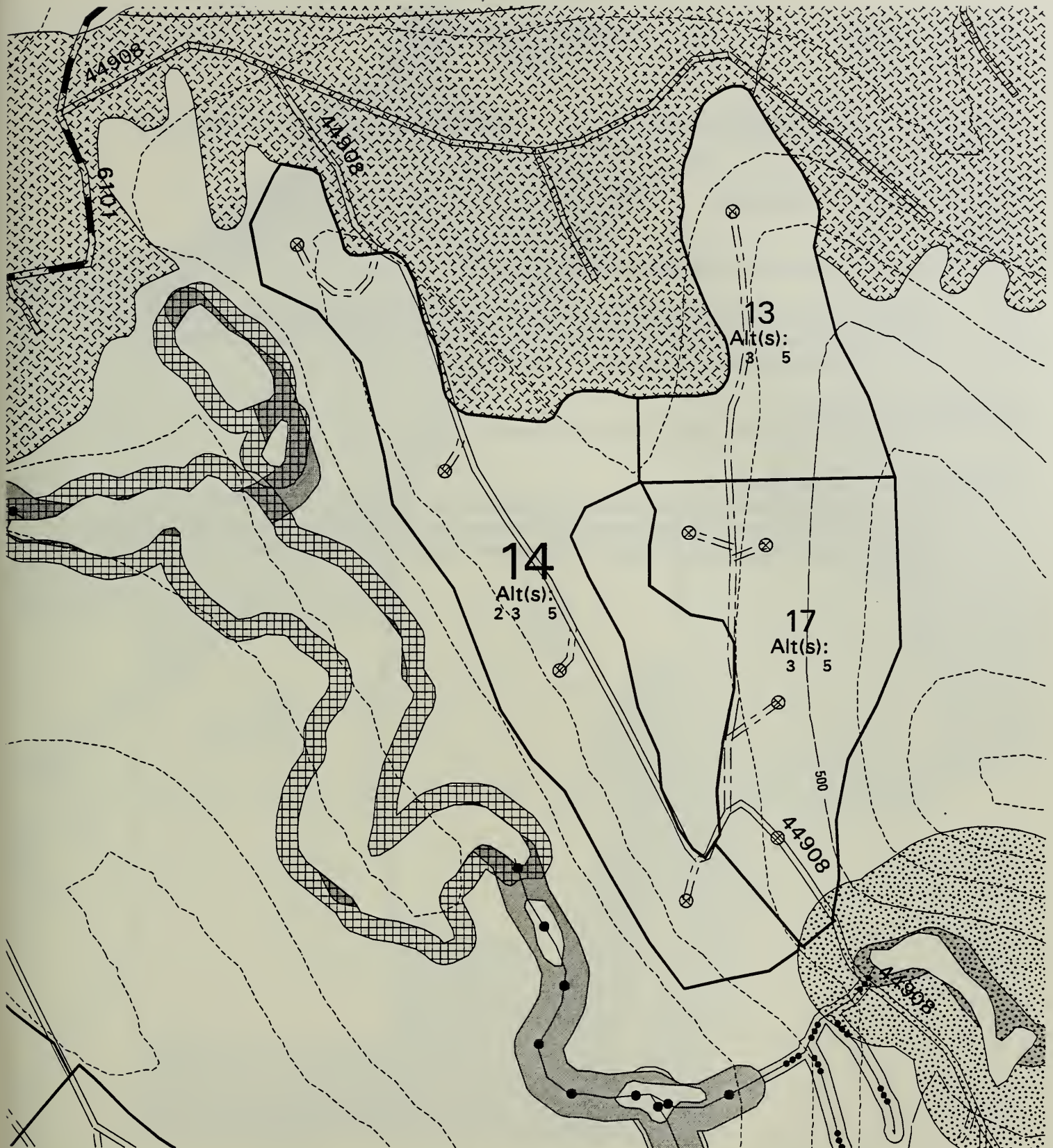
Group Selection - 30% removal (Alternative 2 and 3)  
Group Selection - 40% removal (Alternative 5)

**Logging System and Unit Design**

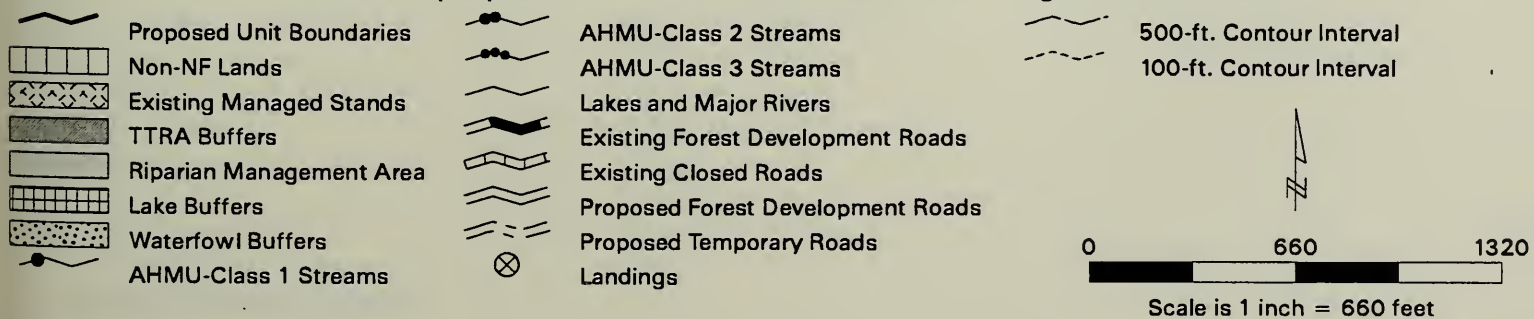
The west side of the unit follows a slope break. The north boundary follows a managed stand, and the west boundary follows a small chain of muskegs. The unit is planned for cable systems with areas that could be shovel logged.



# Crystal Creek Timber Harvest Unit 14



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 15**

Acres: 83      Alternative (s): 2, 4, and 5      MBF Volume: 696      MCF Volume : 243  
1977 Aerial Photo: Flight #: 50      Photo #: 8

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling and yarding in southern half of the unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to single-tree selection with 40% maximum removal of basal area this entry.

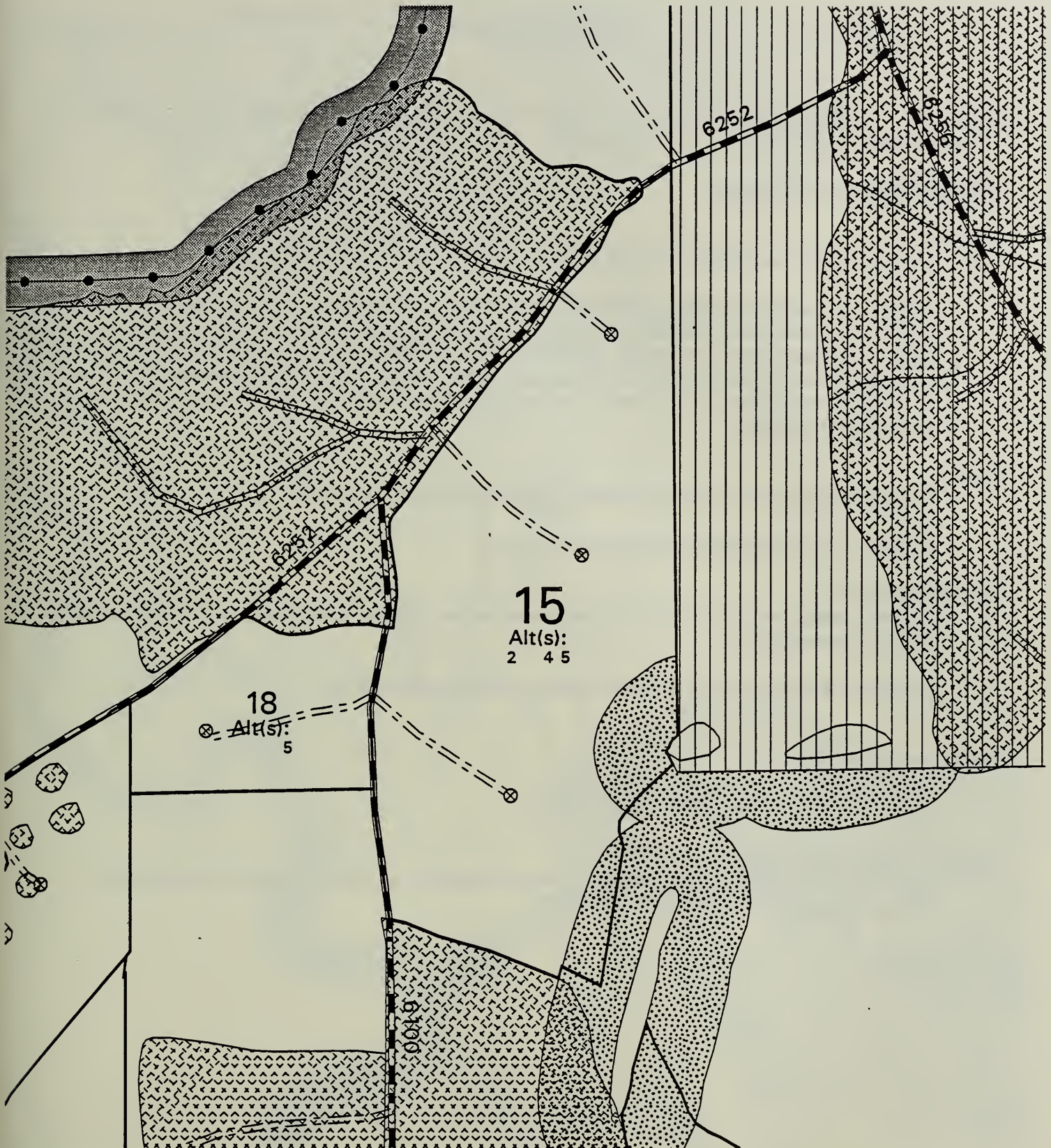
**Silvicultural Prescription**

Single-tree Selection - 0%, 20%, 40%, and 60% removal

**Logging System and Unit Design**

The unit boundary follows managed stands and specified roads. Shovel logging will be used which will minimize soil disturbance. The control area of 0% removal should be placed in the northern quarter of the unit since scattered logging has occurred. The waterfowl buffer will have a maximum removal of 40% of basal area.

# Crystal Creek Timber Harvest Unit 15



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320

Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 17**

Acres: 35      Alternative (s): 3 and 5      MBF Volume: 284 and 378      MCF Volume: 74 and 98  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to unit.

Mitigation: Prohibit tree falling and yarding in the southern one-third of the unit during the period of April 1 to July 31. Prohibit road construction on Road 44908 in Unit 17 and in waterfowl buffer south of the unit during the period of April 1 to June 30. Limit harvest within buffer to road right-of-way clearing and single-tree selection harvest with maximum of 40% removal of basal area for this entry. In Alternative 5, top one large-diameter tree/three acres for future goose nest platform and retain at least three large dead and dying trees/acre where feasible.

**Scenery**

Concern: Upper portion of unit visible from Thomas Bay and Frederick Sound.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in southeastern portion of harvest unit usually in conjunction with rock outcroppings.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 3)

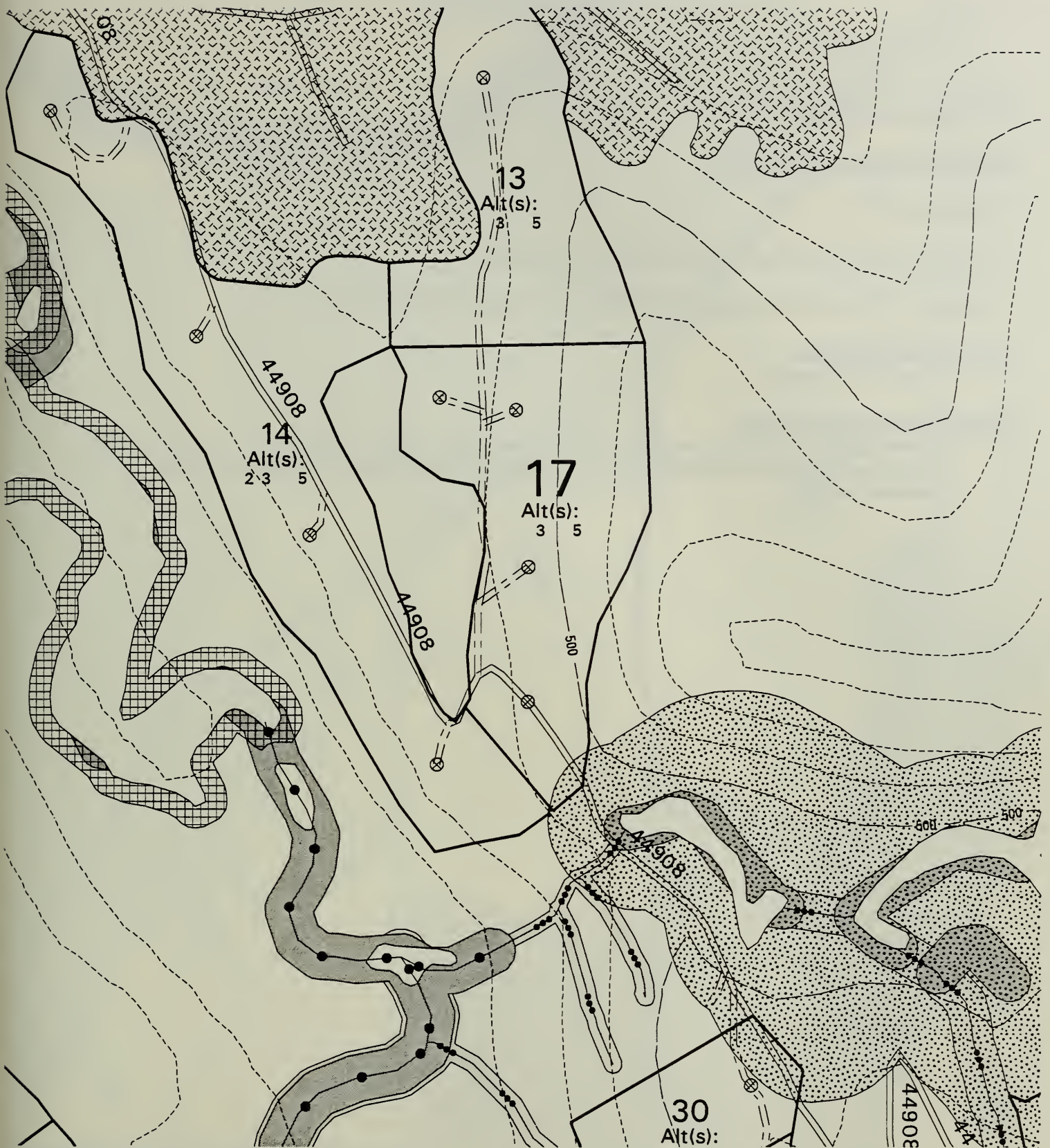
Group Selection - 40% removal (Alternative 5)

**Logging System and Unit Design**

The unit boundary follows slope contours. Short stub temporary road will be needed to minimize cable yarding distance; some shovel yarding is possible.



# Crystal Creek Timber Harvest Unit 17



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320

Scale is 1 inch = 660 feet

**Crystal Creek Unit Card**  
**Unit 18**

Acres: 18      Alternative (s): 5  
1977 Aerial Photo: Flight #: 49

MBF Volume: 419  
Photo #: 154

MCF Volume : 107

**Resource Concerns and Mitigation**

**Recreation**

Concern: Unit will be visible from road to Point Agassiz (6252).

Mitigation: Use reserve tree patches along Road 6252 to minimize visibility of unit.

**Silvicultural Prescription**

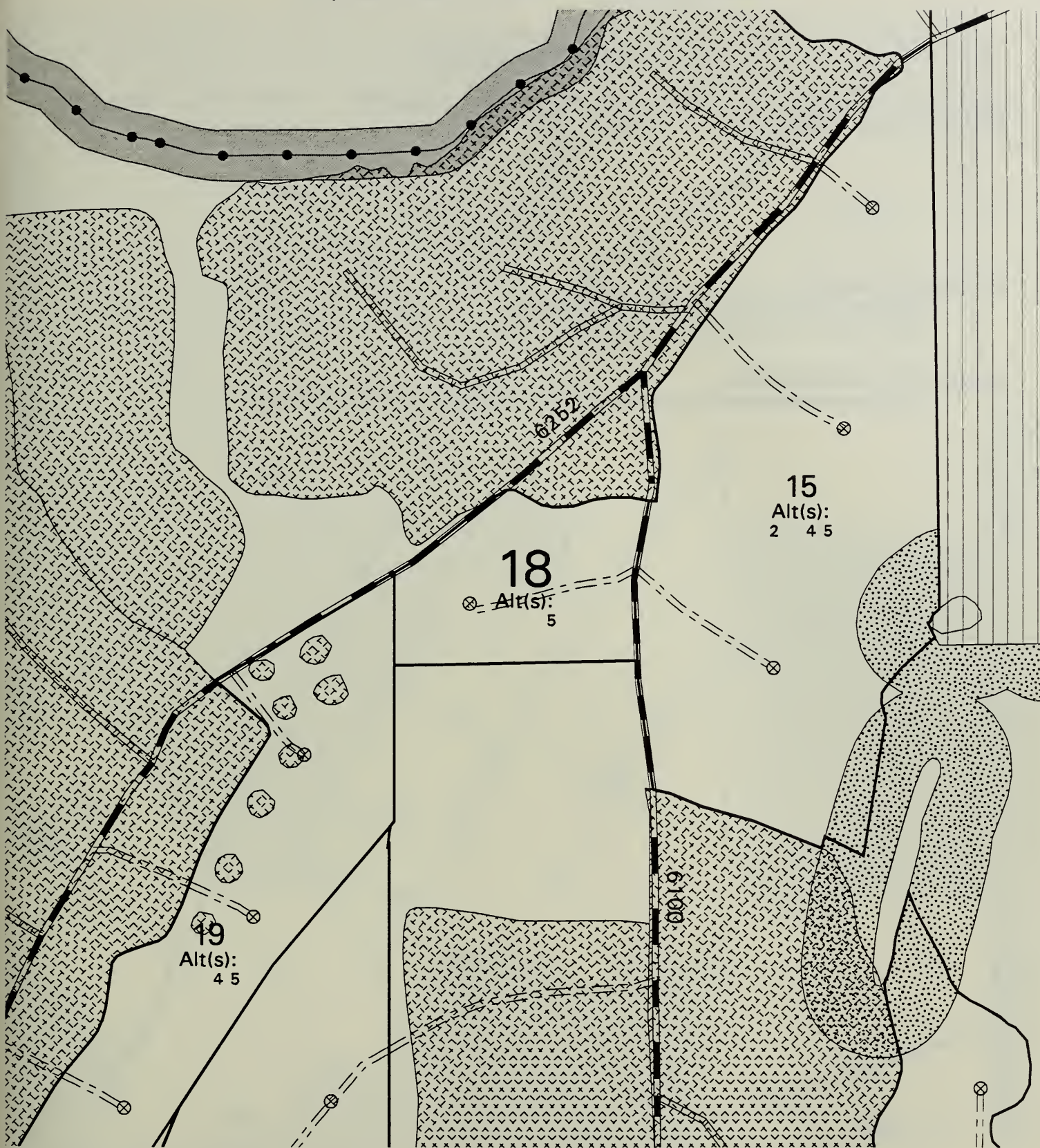
Clearcut with reserves

**Logging System and Unit Design**

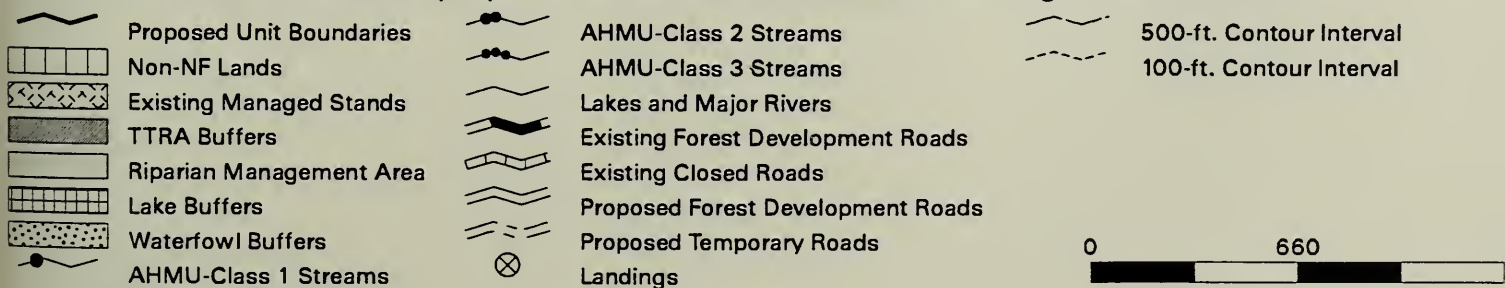
Shovel logging on flat ground will provide for minimal impact during timber harvest. The unit boundary follows specified roads and managed stands. The control block of a previous partial harvest study will be the southern boundary.



# Crystal Creek Timber Harvest Unit 18



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Unit 19**  
**Crystal Creek Unit Card**

Acres: 48      Alternative (s): 4 and 5      MBF Volume: 273 and 409      MCF Volume : 70 and 104  
1977 Aerial Photo: Flight #: 49      Photo #: 154

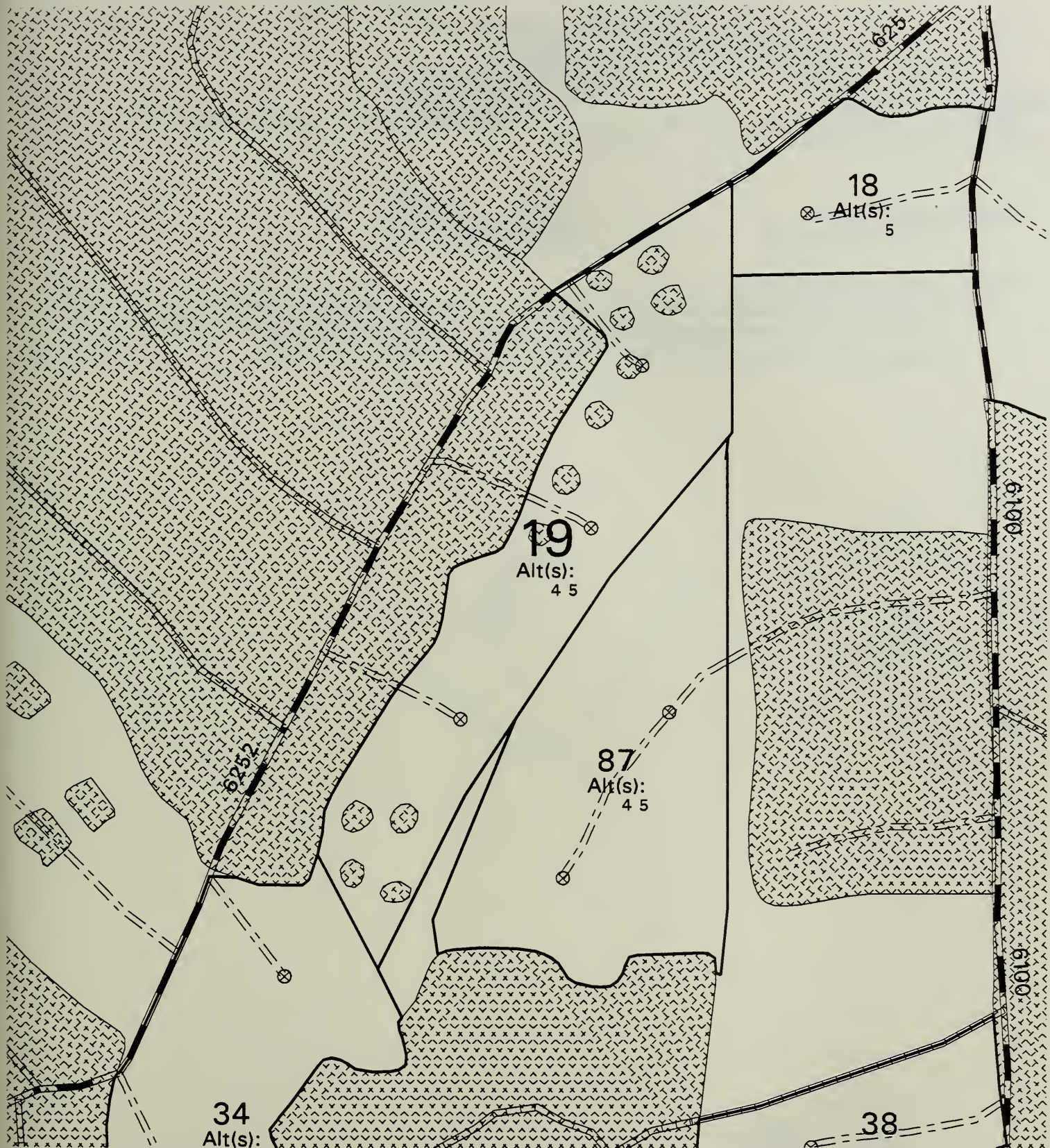
**Silvicultural Prescription**

Single-tree Selection- 20% removal (Alternative 4)  
Group Selection - 30% removal (Alternative 5)

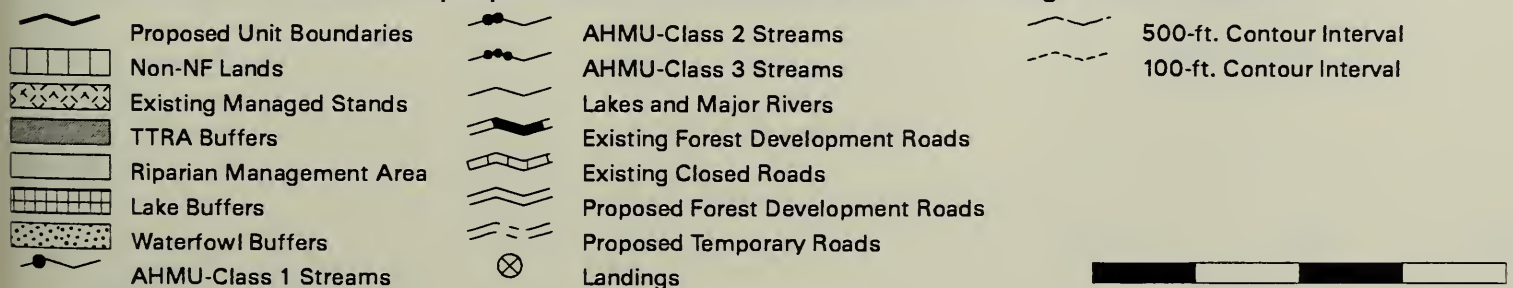
**Logging System and Unit Design**

Unit follows managed stands and a muskeg/grass opening on the east side of boundary.

# Crystal Creek Timber Harvest Unit 19



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**

**Unit 21**

Acres: 37      Alternative (s): 2, 3, and 4

MBF Volume: 643

MCF Volume: 181

1977 Aerial Photo: Flight #: 52

Photo #: 64

**Silvicultural Prescription**

Clearcut with reserves

**Logging System and Unit Design**

The north and east boundary follows a muskeg fringe. The west boundary follows a slope break to the north. This unit will use a combination of shovel yarding to the north and cable yarding from the landing. A temporary road is required and needs to be located to minimize impact on wet areas.



# Crystal Creek Timber Harvest Unit 21



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 22**

Acres: 34      Alternative (s): 5  
1977 Aerial Photo: Flight #: 49

MBF Volume: 838  
Photo #: 154

MCF Volume: 214

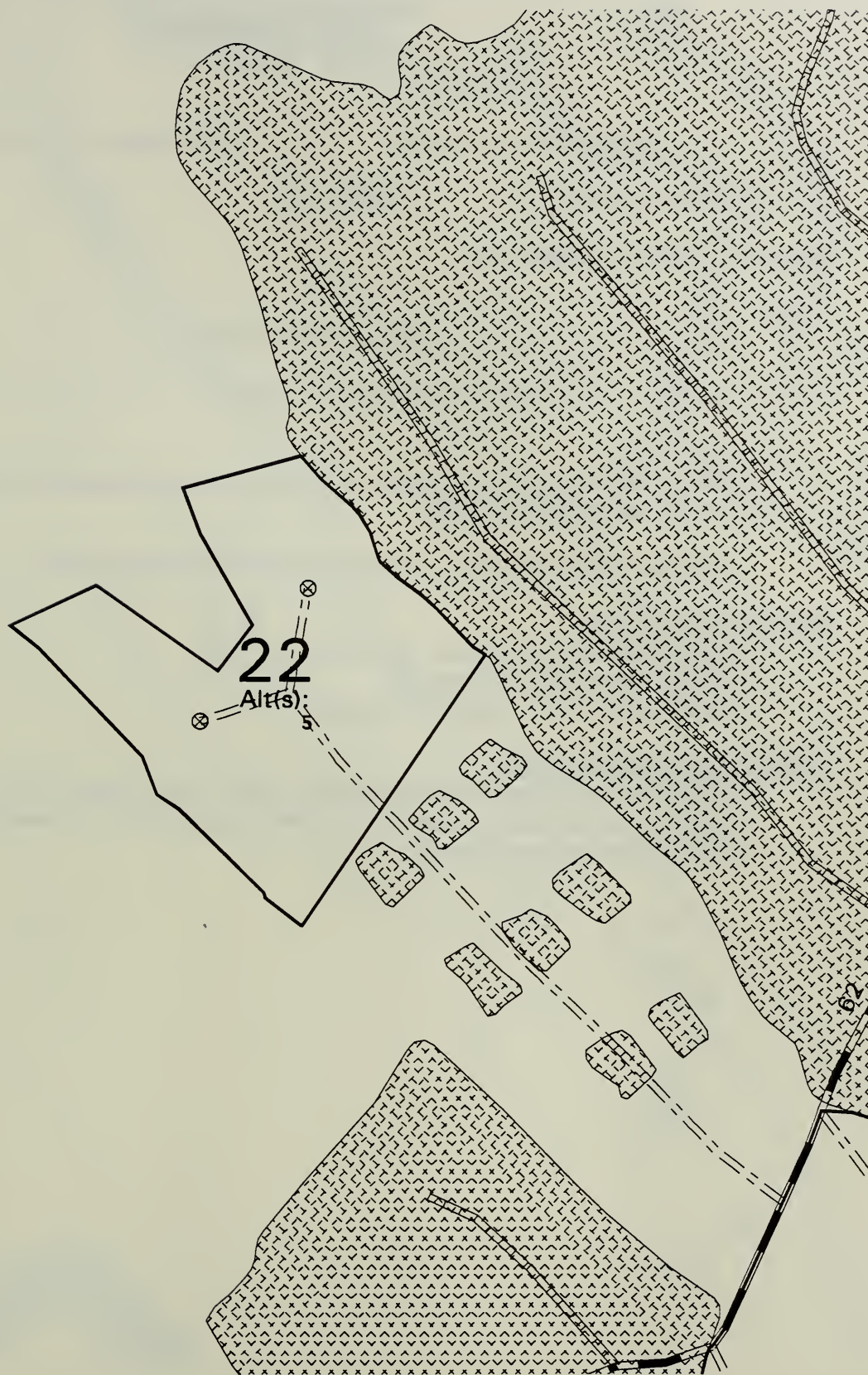
**Silvicultural Prescription**

Clearcut with reserves

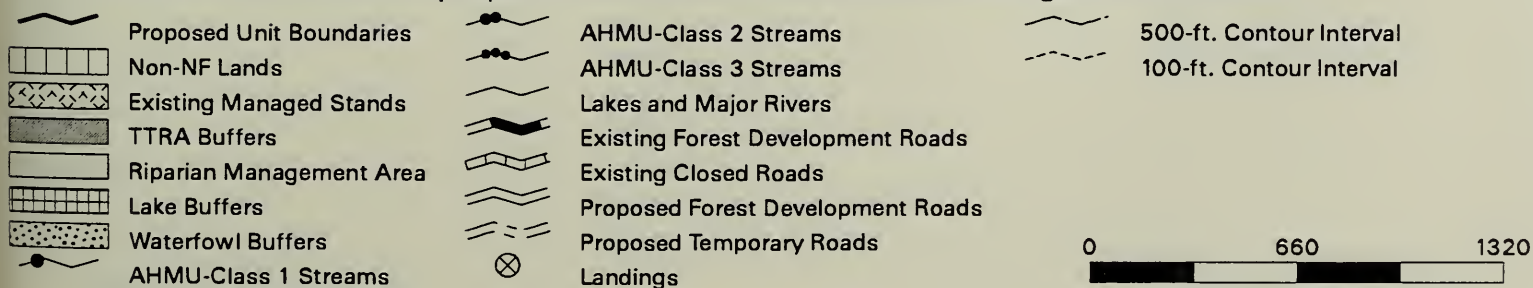
**Logging System and Unit Design**

The north and west boundary follows muskeg and low-volume timber. The east boundary follows a managed stand. The unit is flat; shovel yarding will be used.

# Crystal Creek Timber Harvest Unit 22



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 23**

Acres: 17      Alternative (s): 2, 3, and 4

MBF Volume: 120, 340, and 40    MCF Volume : 32, 90, 11

1977 Aerial Photo: Flight #: 52

Photo #: 64

**Resource Concerns and Mitigation**

**Scenery**

Concern: Portion of unit are visible from Frederick Sound.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the south-central portion of the unit usually in association with rock outcroppings and cliffs.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 2)

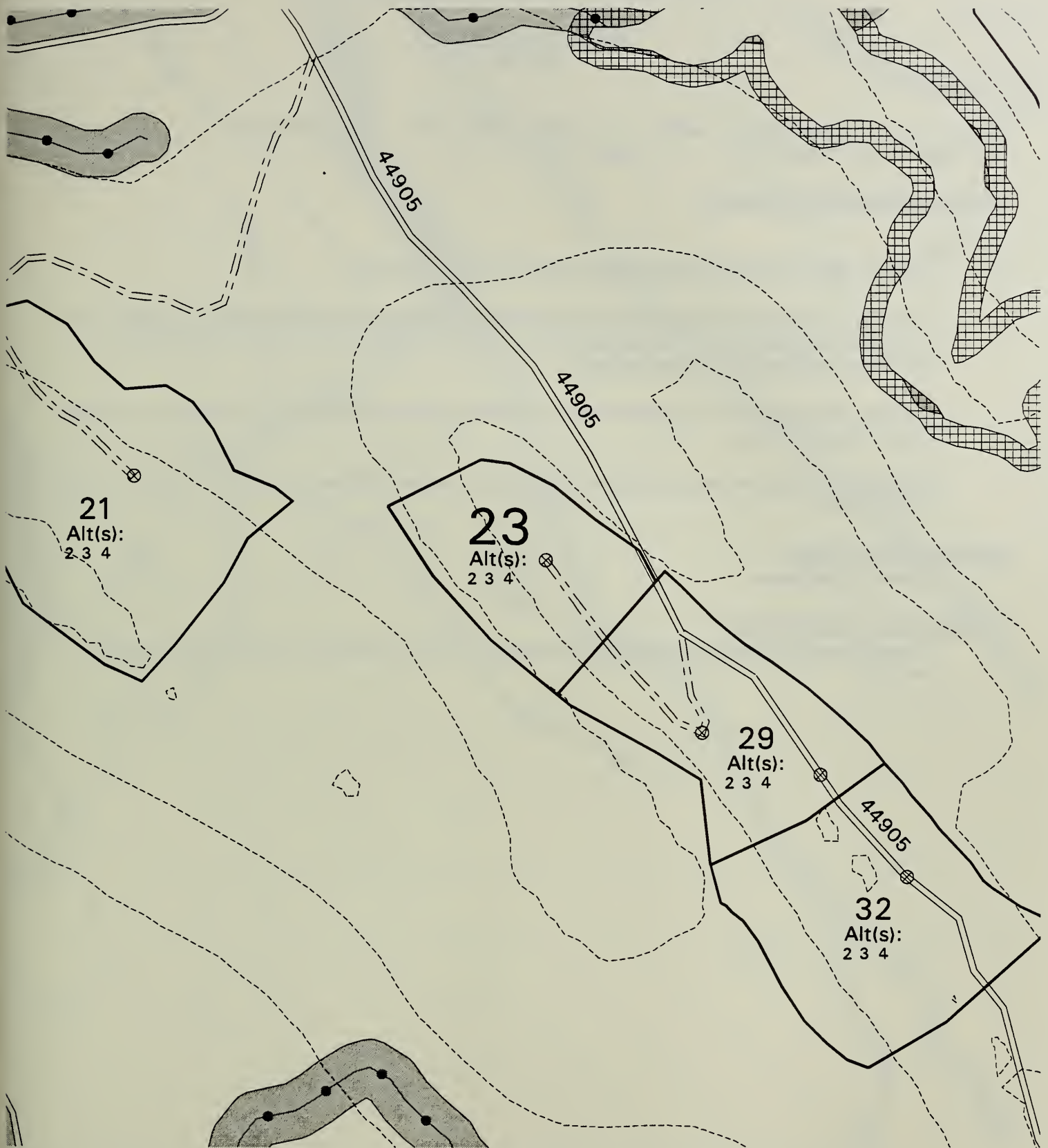
Clearcut with reserves (Alternative 3)

Group Selection - 10% removal (Alternative 4)

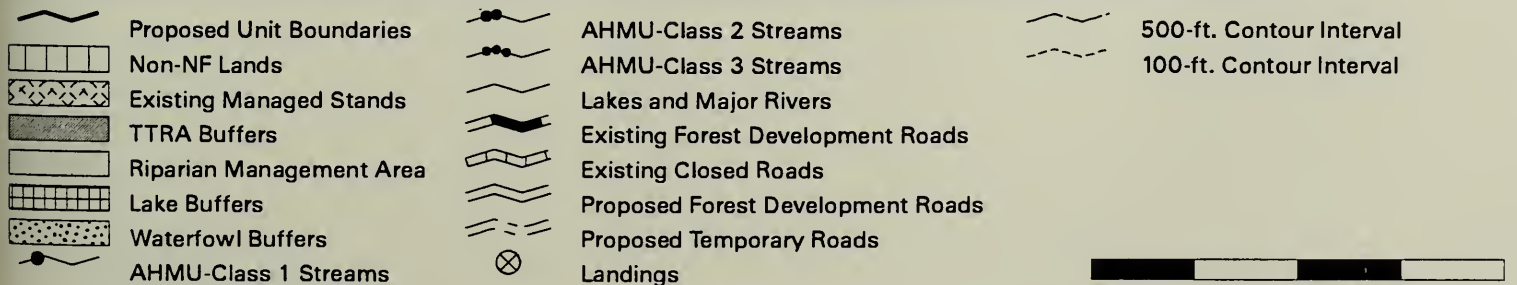
**Logging System and Unit Design**

The west and north boundary follows muskeg and low volume timber to the Specified road. A short temporary road is needed to minimize cable yarding distance. The unit needs to be designed to avoid Maybeso soils to the northern part of the unit.

# Crystal Creek Timber Harvest Unit 23



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 24**

Acres: 25      Alternative (s): 2 and 5      MBF Volume: 616      MCF Volume :157  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation**

**Hydrology**

Concern: High Contained Class III stream channel to the east of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side slope break). Directional fall trees away from notch and yard away from the stream. Maintain a windfirm buffer within the notch.

Concern: Numerous class IV ephemeral streams within the unit (especially southern portion) flow directly into the Class III stream.

Mitigation: Maintain as much log suspension (partial) as possible to maintain channel stability and minimize sedimentation.

**Silvicultural Prescription**

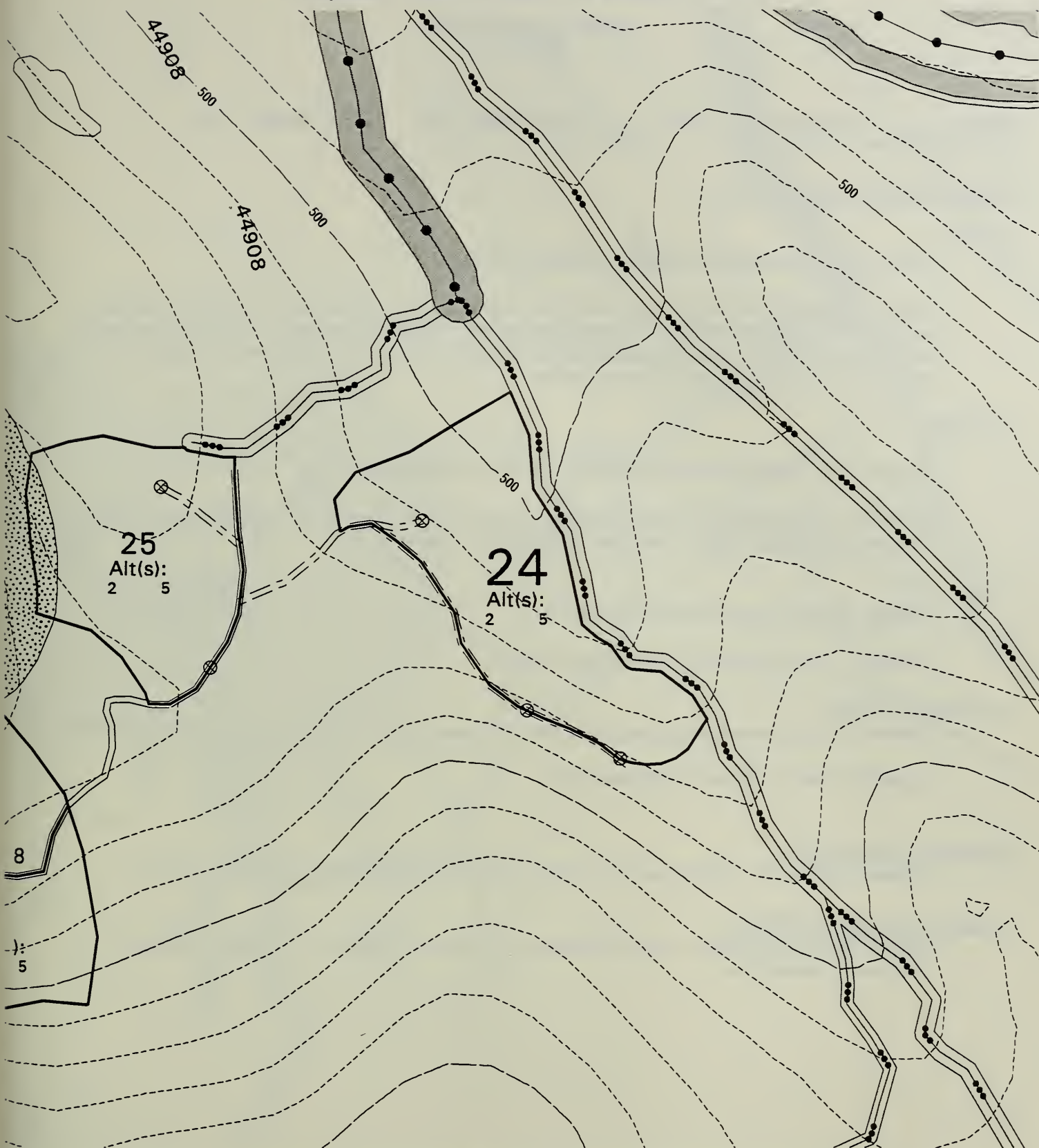
Clearcut with reserves

**Logging System and Unit Design**

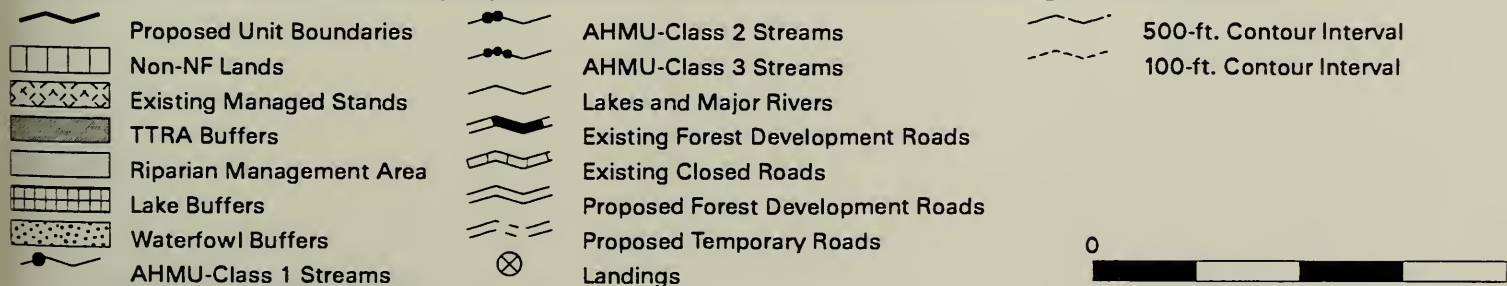
The unit boundary follows ridge breaks. A short temporary road is required to minimize cable yarding distances.



# Crystal Creek Timber Harvest Unit 24



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 25**

Acres: 22      Alternative (s): 2 and 5      MBF Volume: 428      MCF Volume : 118  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in the unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to 40% maximum removal of basal area this entry. Top one large-diameter tree for every three acres in clearcut portion of the unit for future goose nest platforms and retain at least three large dead and dying trees per acre where feasible.

**Hydrology**

Concern: High Contained Class III stream channel to the northeast of the Unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, as defined as the V-notch (side-slope break). Directional fall trees away from the notch.

**Scenery**

Concern: Portion of unit visible from Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope greater than 70% slope along the southwest and northern boundaries.

Mitigation: Unit as designed avoids these slopes.

**Silvicultural Prescription**

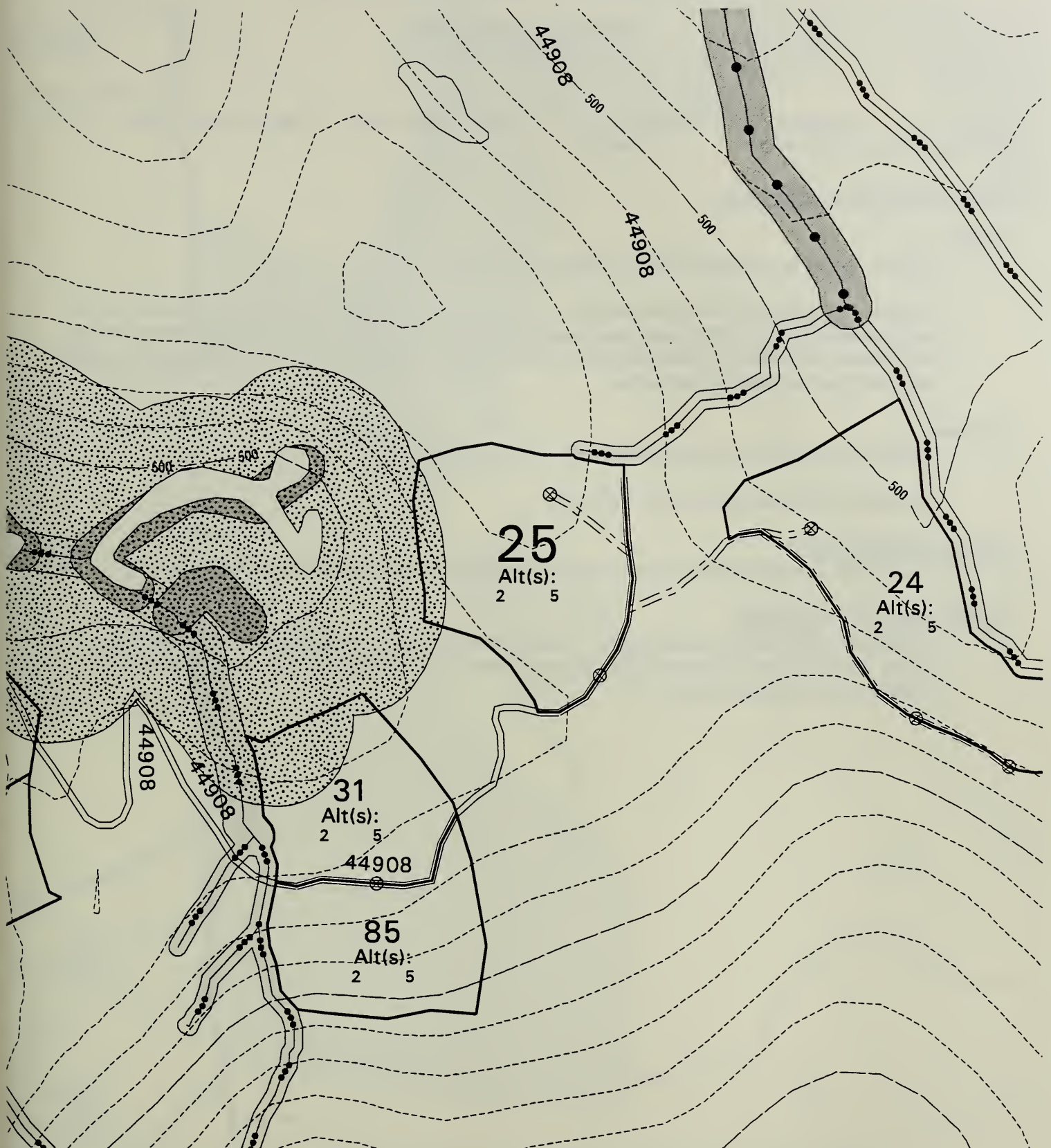
Clearcut with Reserves. Restrict harvest to 40% removal of basal area within the waterfowl buffer.

**Logging System and Unit Design**

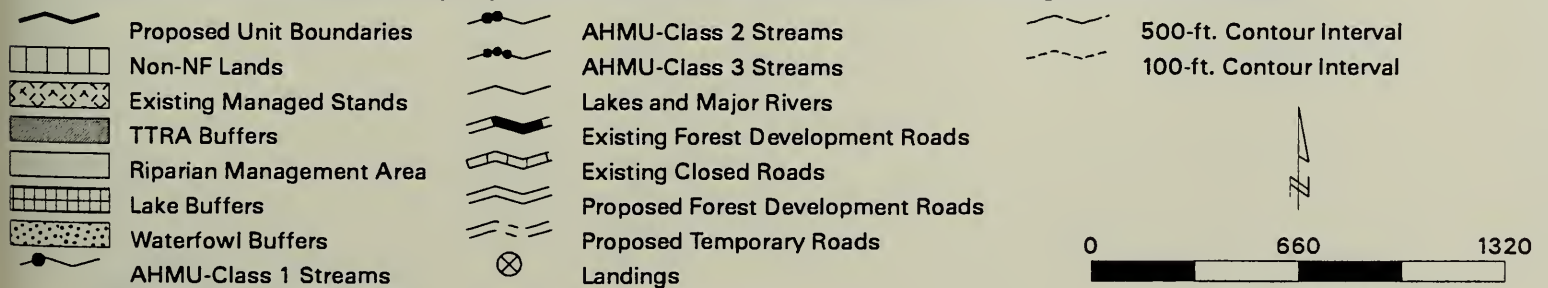
The unit follows slope breaks. A short temporary road is needed to minimize cable yarding distance to minimize soil disturbance.



# Crystal Creek Timber Harvest Unit 25



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 26**

Acres: 24      Alternative (s): 2, 4, and 5  
1977 Aerial Photo: Flight #: 50      Photo #: 8

MBF Volume: 490

MCF Volume : 135

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to 40% maximum removal of basal area this entry. Top one large-diameter tree for every three acres in clearcut portion of the unit for future goose nest platforms and retain at least three large dead and dying trees/acre where feasible.

**Wetlands**

Concern: Forest wetland, maybeso series soils, along eastern border.

Mitigation: Unit is designed to avoid these soils.

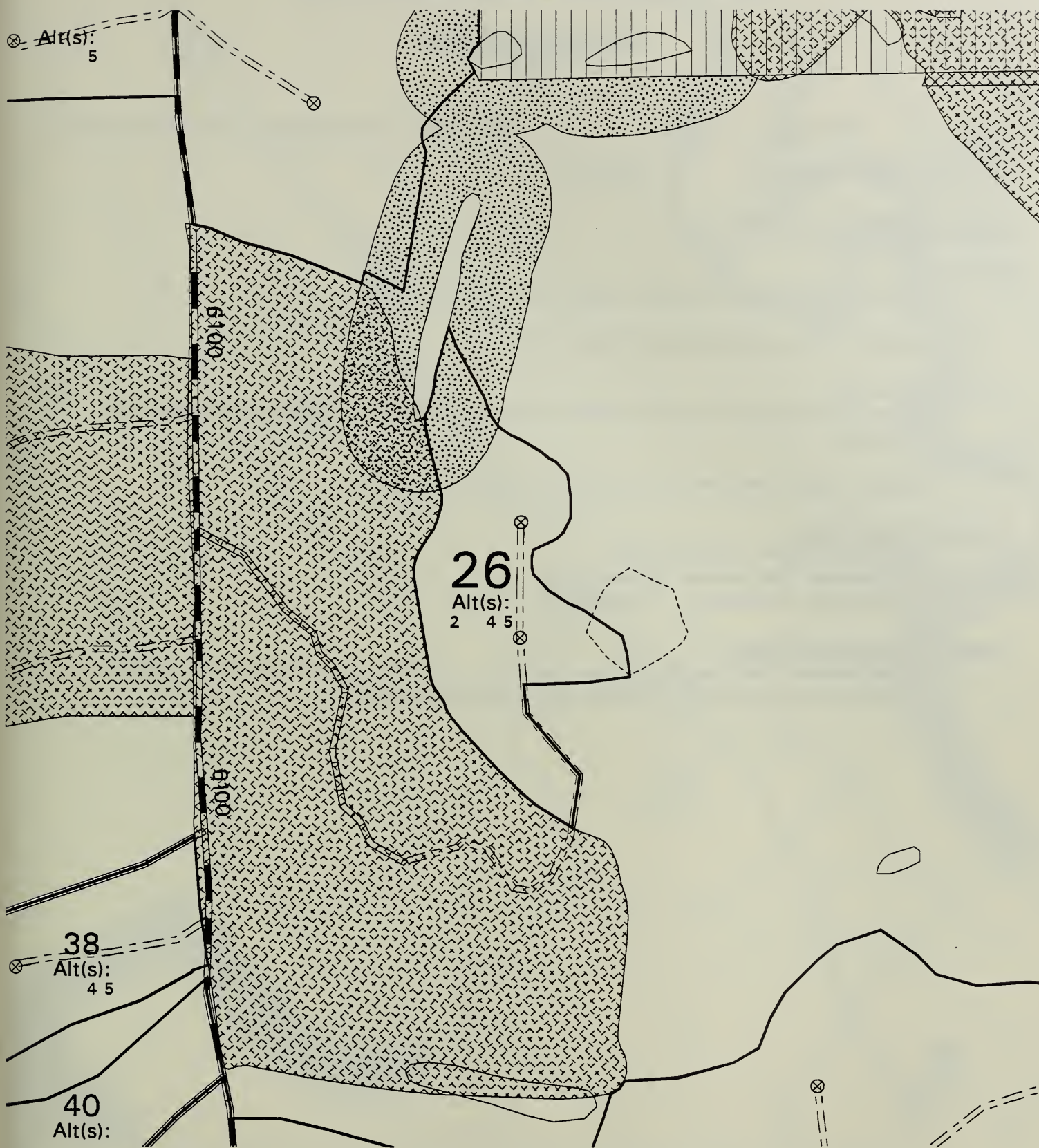
**Silvicultural Prescription**

Clearcut with reserves. Restrict harvest to 40% removal of basal area within the waterfowl buffer.

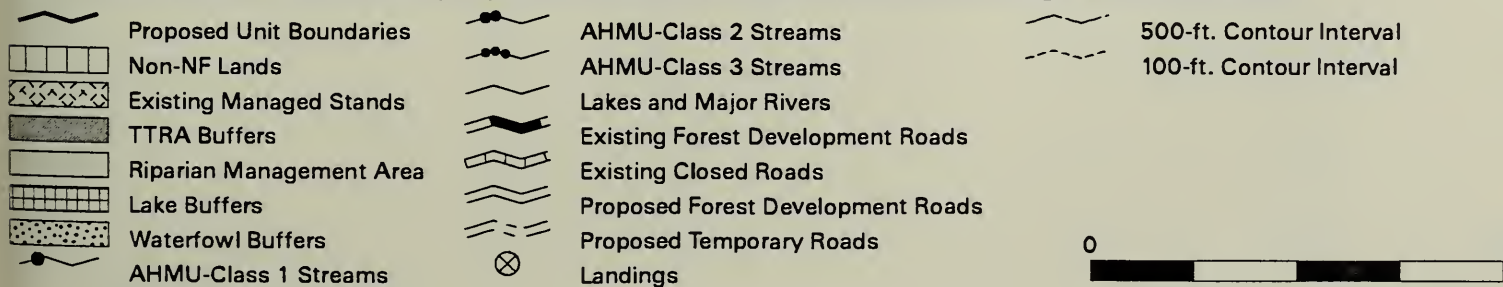
**Logging System and Unit Design**

The unit boundary follows managed stands. The east boundary follows muskeg fringe and low volume timber. Part of the unit was dropped due to forested wetland soil. A short temporary road is required to minimize shovel yarding distances.

# Crystal Creek Timber Harvest Unit 26



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 29**

Acres: 21      Alternative (s): 2, 3, and 4  
42, 14

MBF Volume: 459, 162, and 54    MCF Volume : 119,

1977 Aerial Photo: Flight #: 52

Photo #: 64

**Resource Concerns and Mitigation**

**Scenery**

Concern: Portion of unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the west-central portion of unit at base of cliff and rock outcropping.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Clearcut with reserves (Alternative 2)

Group Selection - 30% removal (Alternative 3)

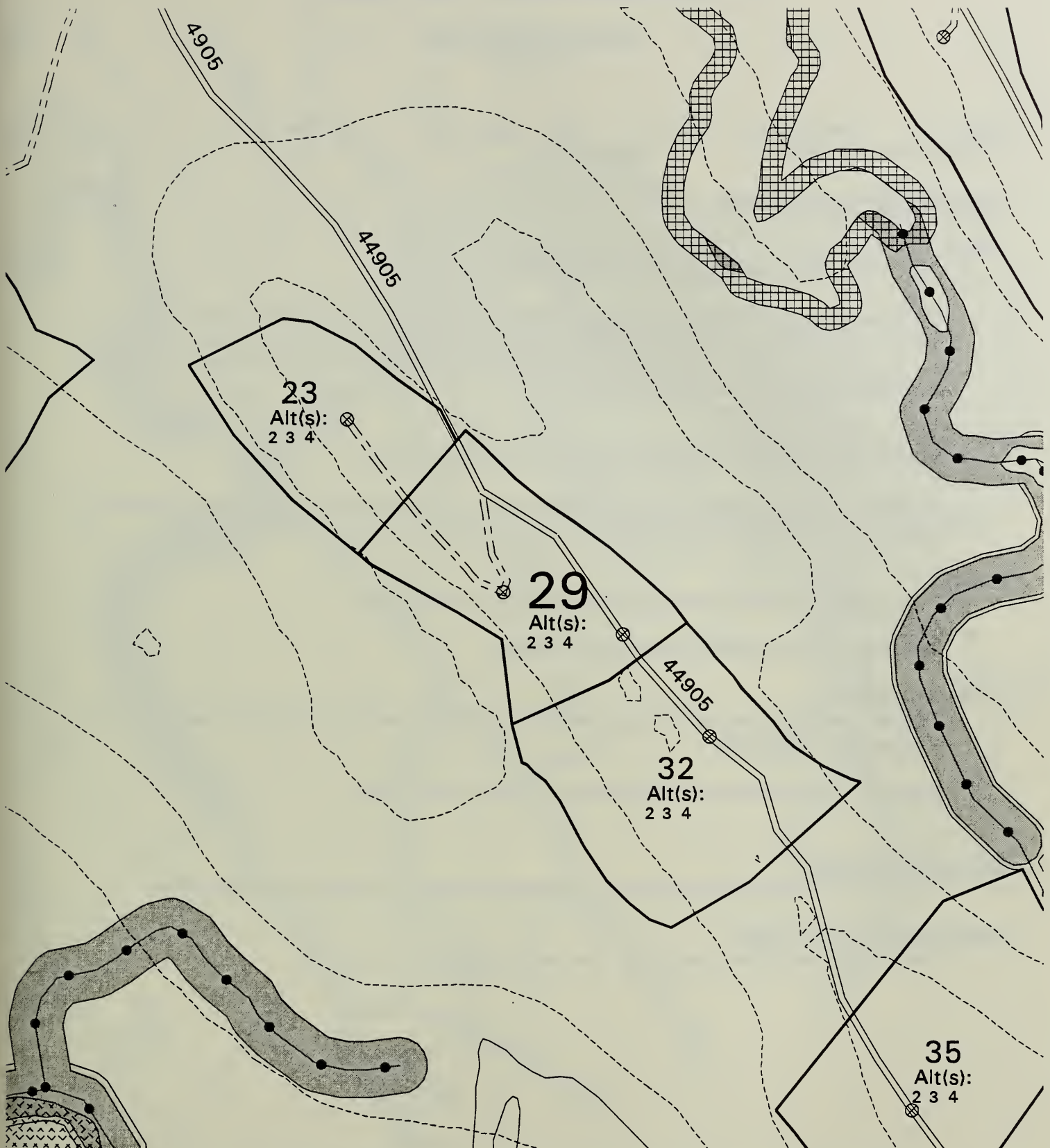
Group Selection - 10% removal (Alternative 4)

**Logging System and Unit Design**

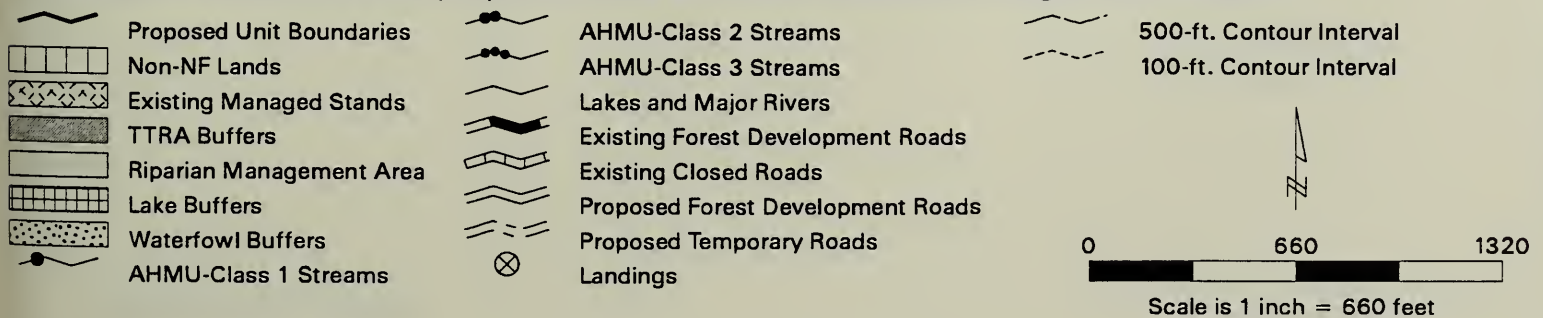
The west boundary follows muskeg edge and slope break. The east boundary follows the slope contour. A combination of cable and shovel yarding are the planned harvest systems.



# Crystal Creek Timber Harvest Unit 29



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**

**Unit 30**

Acres: 13      Alternative (s): 2 and 5      MBF Volume: 296      MCF Volume : 75  
1977 Aerial Photo: Flight #: 52      Photo #: 64

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in the unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to 40% maximum removal of basal area this entry. Top one large-diameter tree for every three acres in clearcut portion of unit for future goose nest platforms and retain at least three large dead and dying trees/acre where feasible.

**Hydrology**

Concern: High Contained Class III stream channel southwest of the unit

Mitigation: No programmed commercial timber harvest within the Class III Riparian Management Area, defined as the V-notch (side-slope break). Directional fall trees away from the notch.

**Scenery**

Concern: Portion of unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: The eastern portion of the unit contains isolated areas of steep slope usually in association with cliffs and rock outcroppings.

Mitigation: Retain some trees on steep terrain to maintain slope stability.

**Silvicultural Prescription**

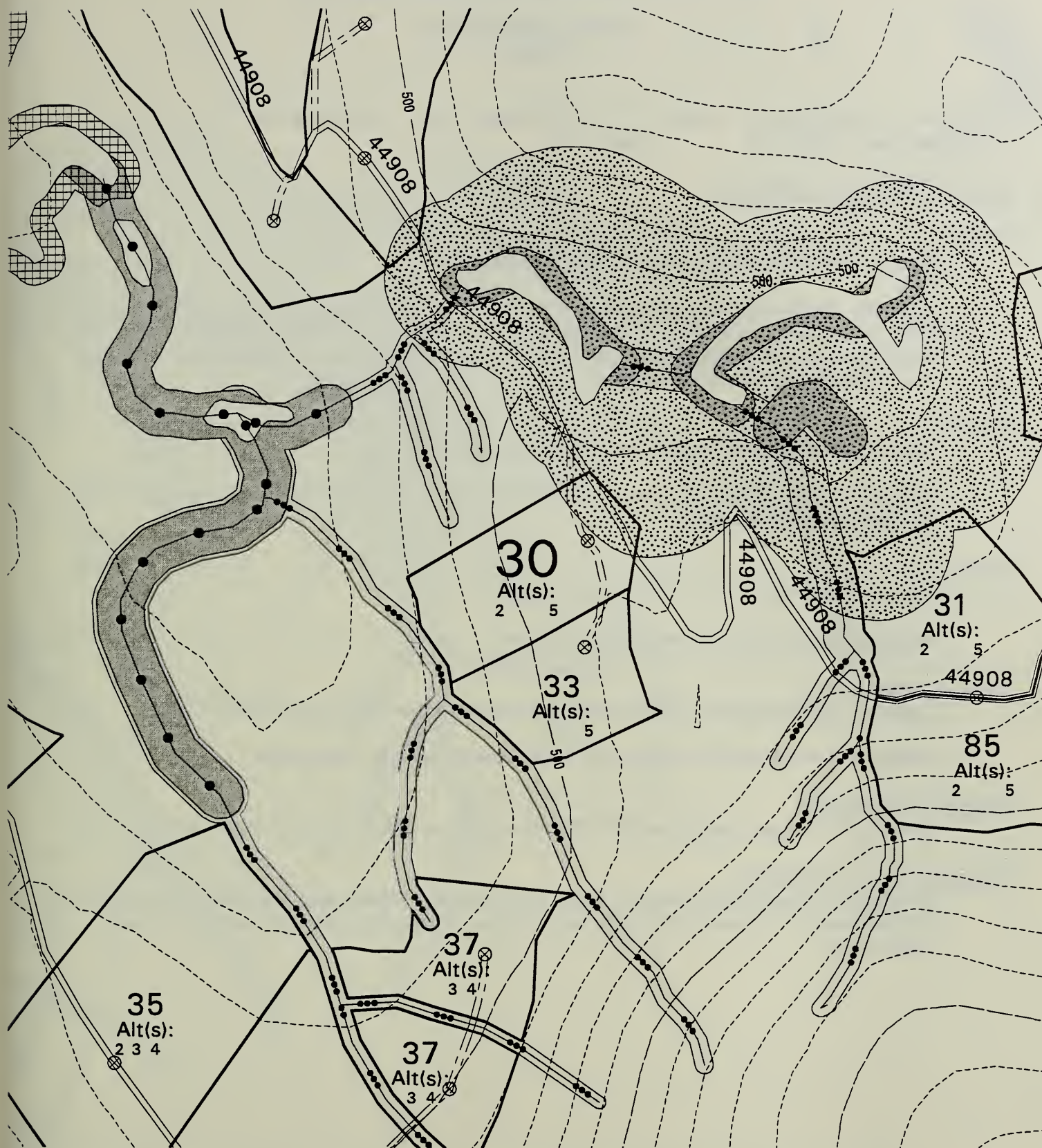
Clearcut with reserves. Restrict harvest to 40% removal of basal area within the waterfowl buffer.

**Logging System and Unit Design**

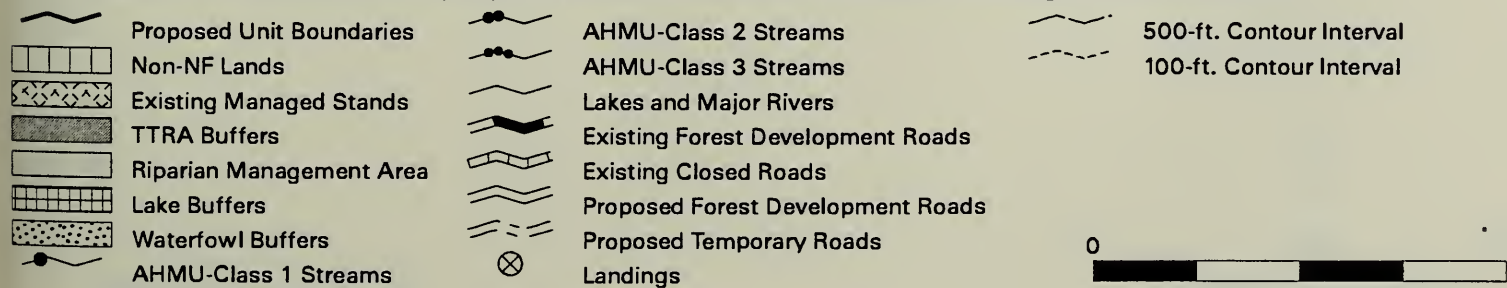
The unit boundary follows slope breaks. The unit is planned for cable system.



# Crystal Creek Timber Harvest Unit 30



Alternatives that include the proposed units are listed beneath the larger unit numbers.





## Crystal Creek Unit Card

### Unit 31

Acres: 14      Alternative (s): 2 and 5      MBF Volume: 265      MCF Volume : 73  
1977 Aerial Photo: Flight #: 53      Photo #: 96

### Resource Concerns and Mitigation

#### **Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in the unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to 40% maximum removal of basal area this entry. Top one large diameter tree per three acres in clearcut portion of unit for future goose nest platforms and retain at least three large dead and dying trees/acre where feasible.

#### **Hydrology**

Concern: High Contained Class III stream channel southwest of the unit.

Mitigation: No Programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

#### **Scenery**

Concern: Portion of unit visible from Frederick Sound.

Mitigation: Unit as designed addresses scenic concern.

#### **Landslide Prone Soils**

Concern: Isolated steep slopes in the northern and southern portion of unit along boundary.

Mitigation: Retain some trees (reserves) on steeper slopes to maintain slope stability.

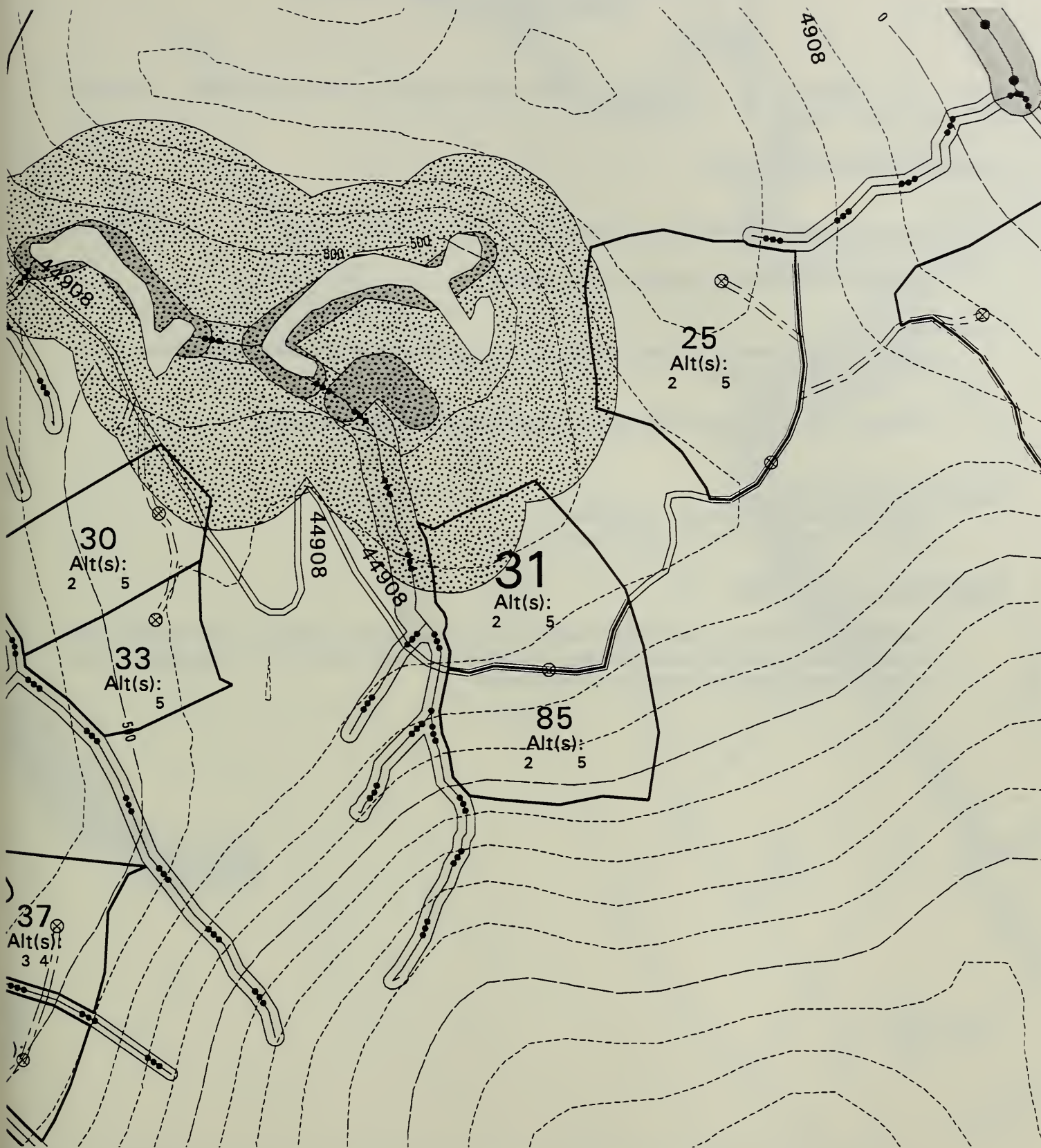
### Silvicultural Prescription

Clearcut with Reserves. Restrict harvest to 40% removal of basal area within the waterfowl buffer.

### Logging System and Unit Design

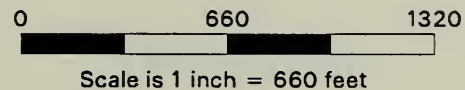
The unit follows slope breaks along the north and east boundary. Muskeg holes and Class III streams provide the west boundary. The Road 44908 is the south boundary. Cable yarding from the road is the planned harvest system.

# Crystal Creek Timber Harvest Unit 31



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**

**Unit 32**

Acres: 27      Alternative (s): 2, 3, and 4      MBF Volume: 226, 641, and 641      MCF Volume : 57, 161, 161  
1977 Aerial Photo: Flight #: 52      Photo #: 64

**Resource Concerns and Mitigation**

**Scenery**

Concern: Portion of unit visible from Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the northwest portion of harvest unit in association with cliffs and rock outcroppings.

Mitigation: Retain some trees (reserves) on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 2)

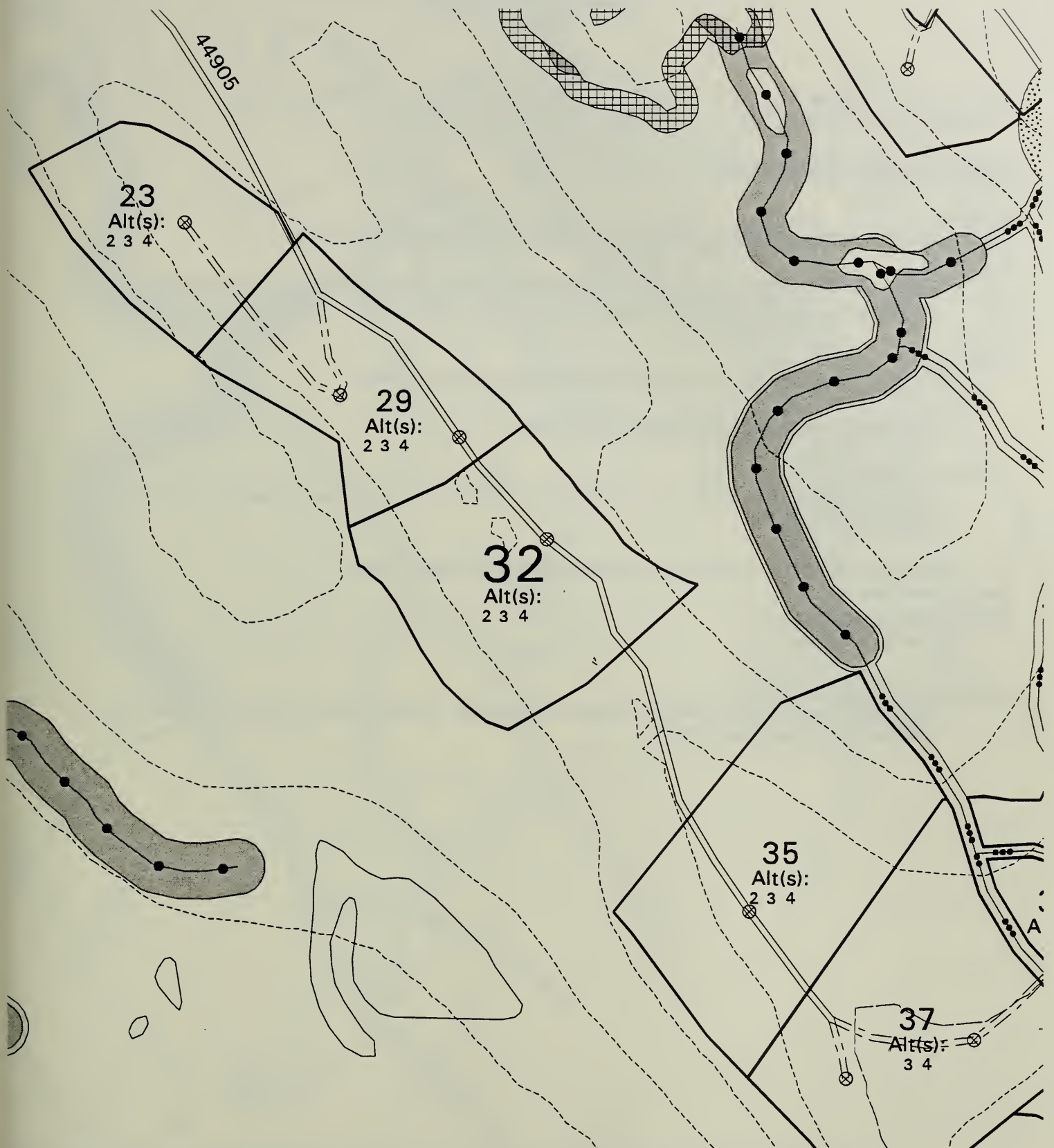
Clearcut with Reserves (Alternative 3 and 4)

**Logging System and Unit Design**

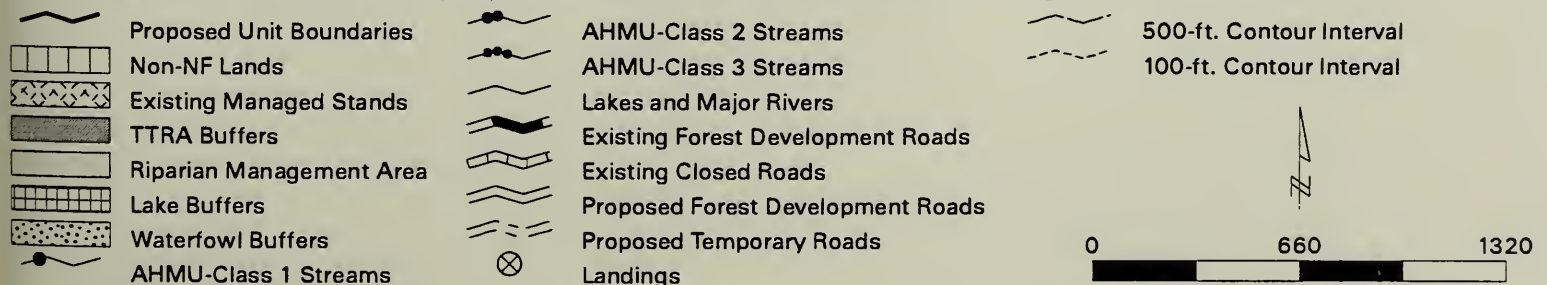
Unit boundary follows low volume timber/muskeg along the east and west boundary. South boundary follows a logical yarding boundaries. North boundary has common boundary with Unit 29. Combination of shovel and cable systems with short temporary road are planned.



# Crystal Creek Timber Harvest Unit 32



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Crystal Creek Unit Card  
Unit 33

Acres: 9      Alternative (s): 5  
1977 Aerial Photo: Flight #: 52

MBF Volume: 222  
Photo #: 64

MCF Volume : 57

**Resource Concerns and Mitigation**

**Hydrology**

Concern: High Contained, Class III stream channel to the southwest of the unit.

Mitigation: No Programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break). Directional fall trees away from the notch.

**Scenery**

Concern: Portion of unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the eastern portion of the unit in association with rock outcroppings and cliffs.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

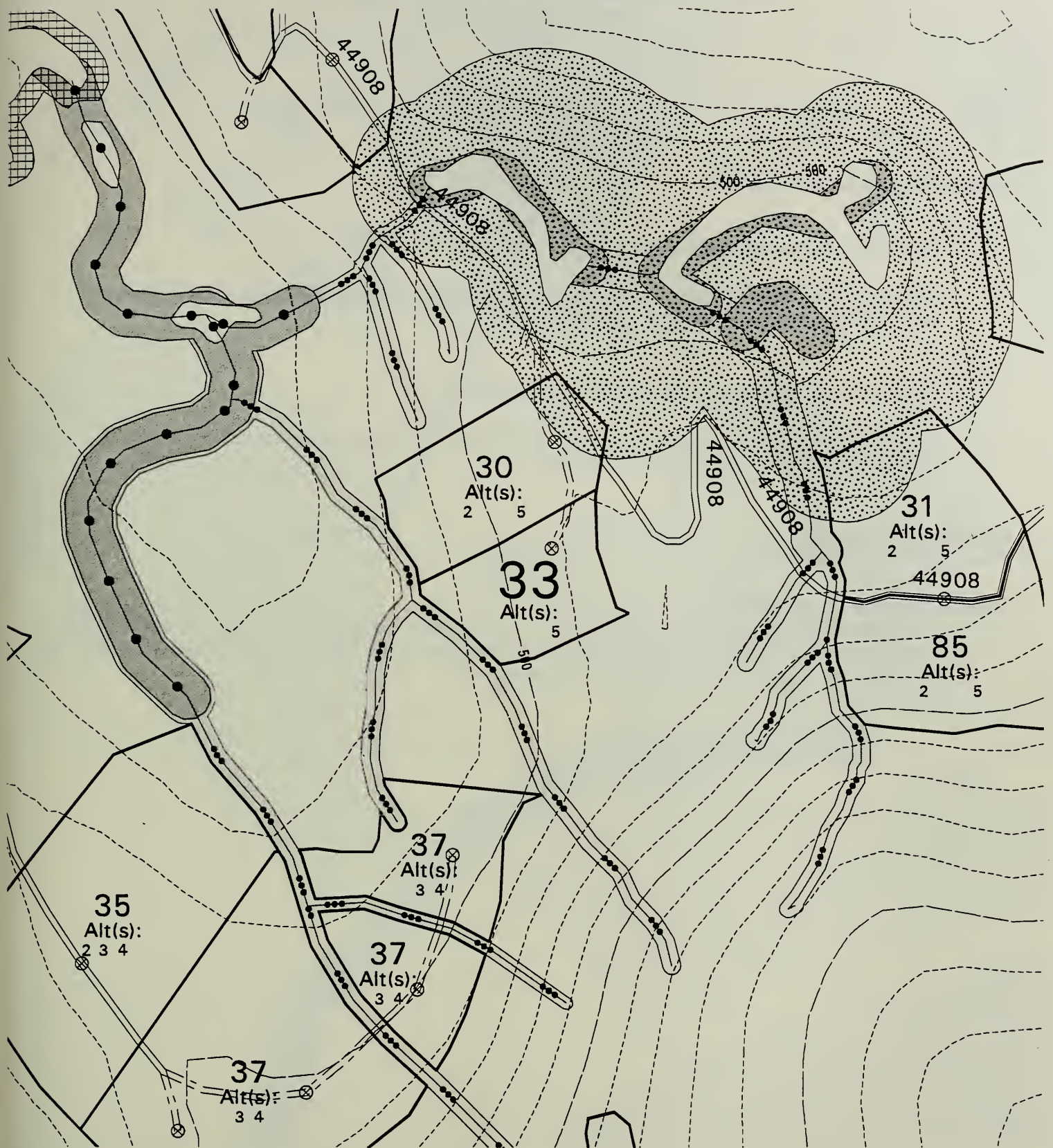
Clearcut with Reserves

**Logging System and Unit Design**

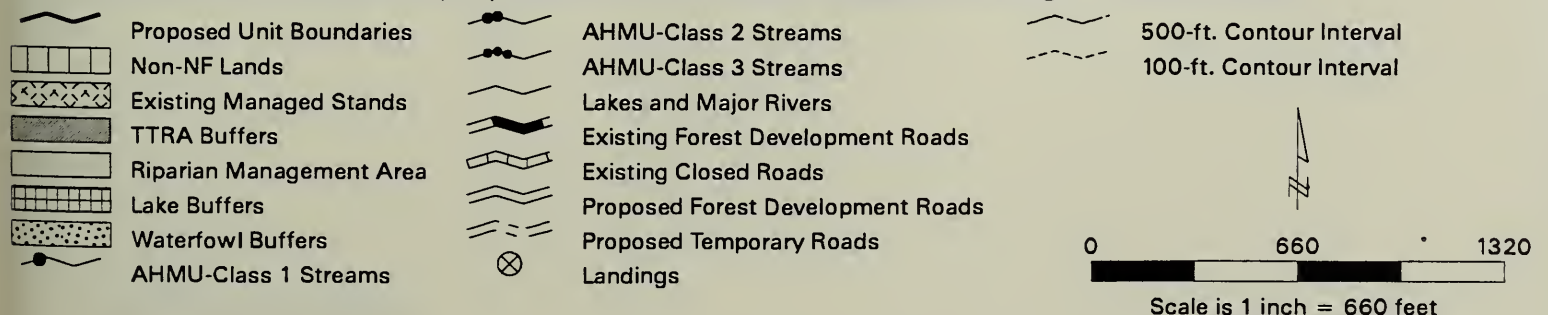
Slope breaks and Class III stream determine unit boundaries. Stub temporary road required to minimize cable yarding distance from landing.



# Crystal Creek Timber Harvest Unit 33



Alternatives that include the proposed units are listed beneath the larger unit numbers.





Crystal Creek Unit Card  
Unit 34

Acres: 47      Alternative (s): 5  
1977 Aerial Photo: Flight #: 49

MBF Volume: 267  
Photo #: 154

MCF Volume: 68

Resource Concerns and Mitigation

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling, yarding, and road construction within the unit during the period of April 1 to July 31.

**Fisheries**

Concern: Palustrine, Class I channel to the south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the stream. No programmed commercial timber harvest in the Riparian Management Area.

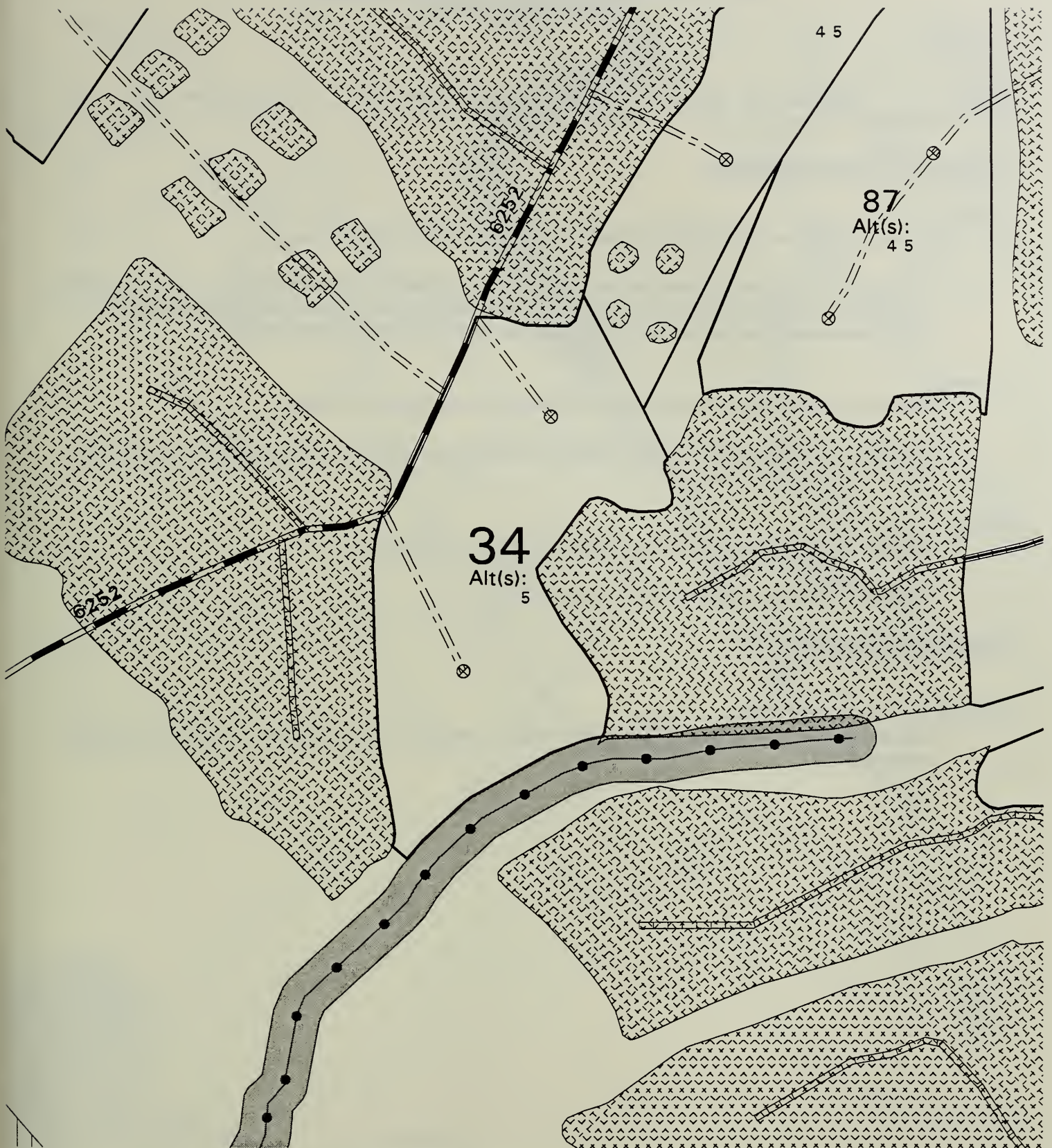
Silvicultural Prescription

Clearcut with reserves

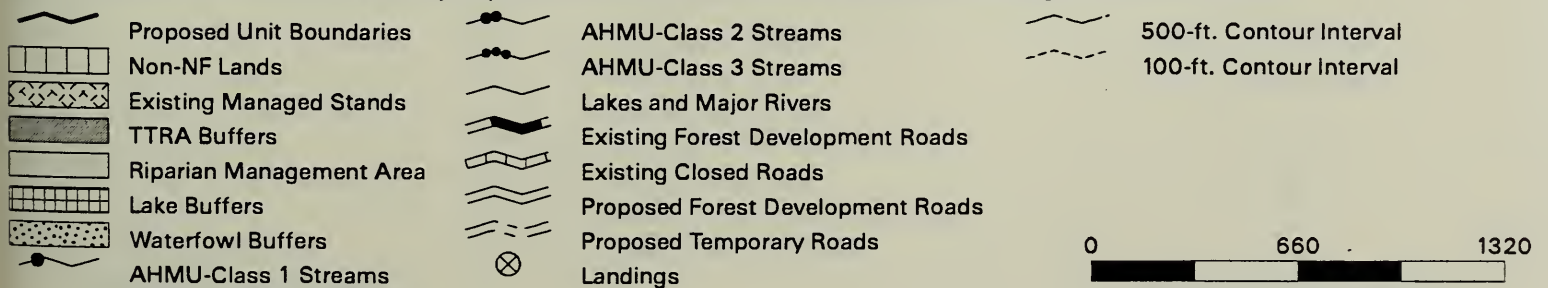
Logging System and Unit Design

East and west boundary borders managed stands. South boundary borders Class I stream plus 100 foot buffer. North boundary is common with Unit 19. Flat ground accessed by two short temporary roads to minimize shovel yarding distance which minimizes soil disturbance.

# Crystal Creek Timber Harvest Unit 34



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 35**

Acres: 33      Alternative (s): 2, 3, and 4  
1977 Aerial Photo: Flight #: 52      Photo #: 64

MBF Volume: 762

MCF Volume : 193

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control channel to the north tip of the unit.

Mitigation: No commercial timber harvest within 100 feet of the Class I stream channel, and no programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens or 120 feet ( the height of one site-potential tree)).

**Hydrology**

Concern: High Contained, Class III stream channel to the northeast of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Scenery**

Concern: Portion of unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Silvicultural Prescription**

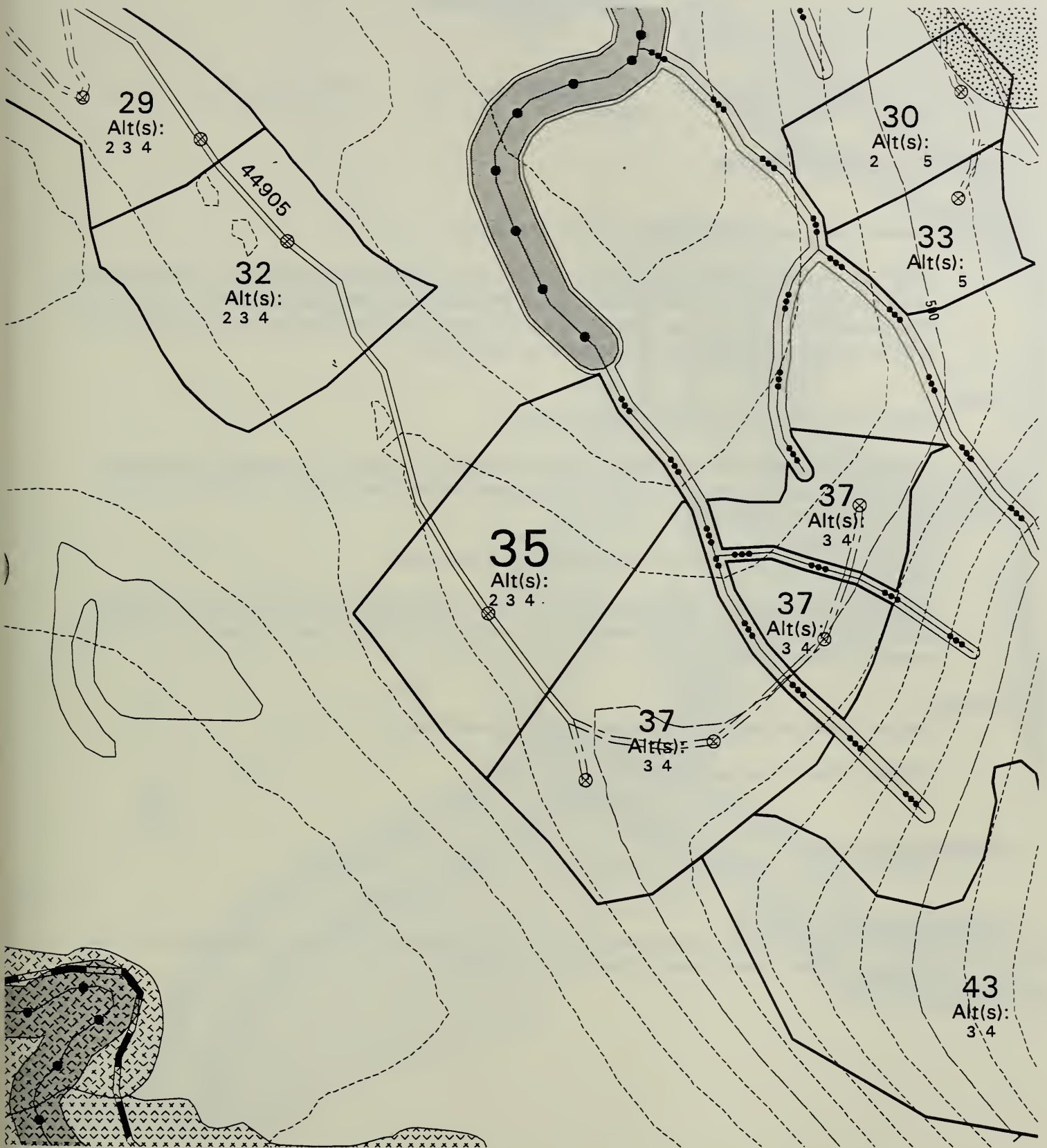
Clearcut with reserves

**Logging System and Unit Design**

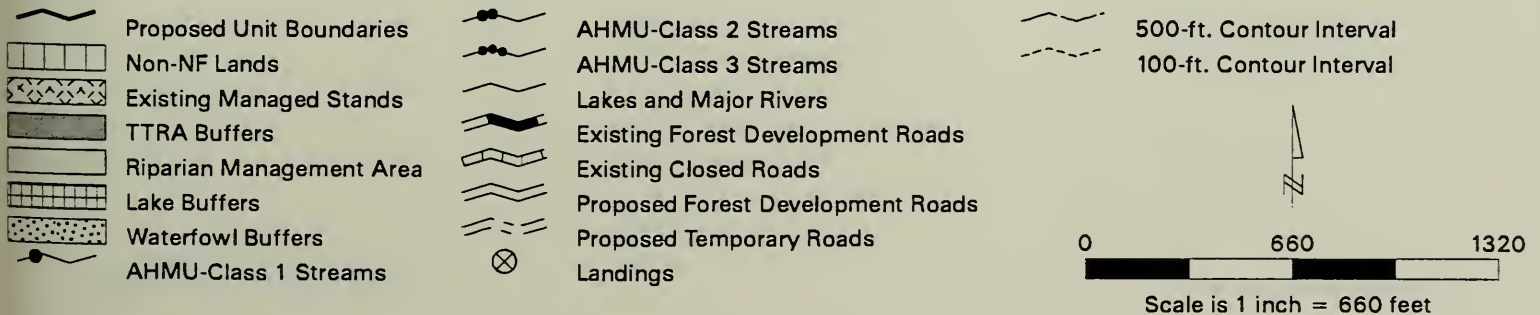
East and west boundaries follow slope breaks. South boundary is common with unit 37. Cable logging from temporary road.



# Crystal Creek Timber Harvest Unit 35



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Crystal Creek Unit Card  
Unit 36

Acres: 13      Alternative (s): 5  
1977 Aerial Photo: Flight #: 50

MBF Volume: 115  
Photo #: 7

MCF Volume: 30

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in unit during the period of April 1 to July 31. Restrict harvest within waterfowl buffer to single-tree selection with 40% maximum removal of basal area this entry. Top one large-diameter tree for every three acres in clearcut portion of the unit for future goose nest platforms and retain at least three large dead and dying trees/acre where feasible.

**Fisheries**

Concern: Palustrine, Class I channel west of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils or riparian associated wetland fens).

Concern: Glacial Outwash, Class I channel to the south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils. riparian associated wetland fens, or 140 feet).

**Wetlands**

Concern: Forest wetlands soils (maybeso) along northwestern border.

Mitigation: Unit is designed to avoid these soils.

**Silvicultural Prescription**

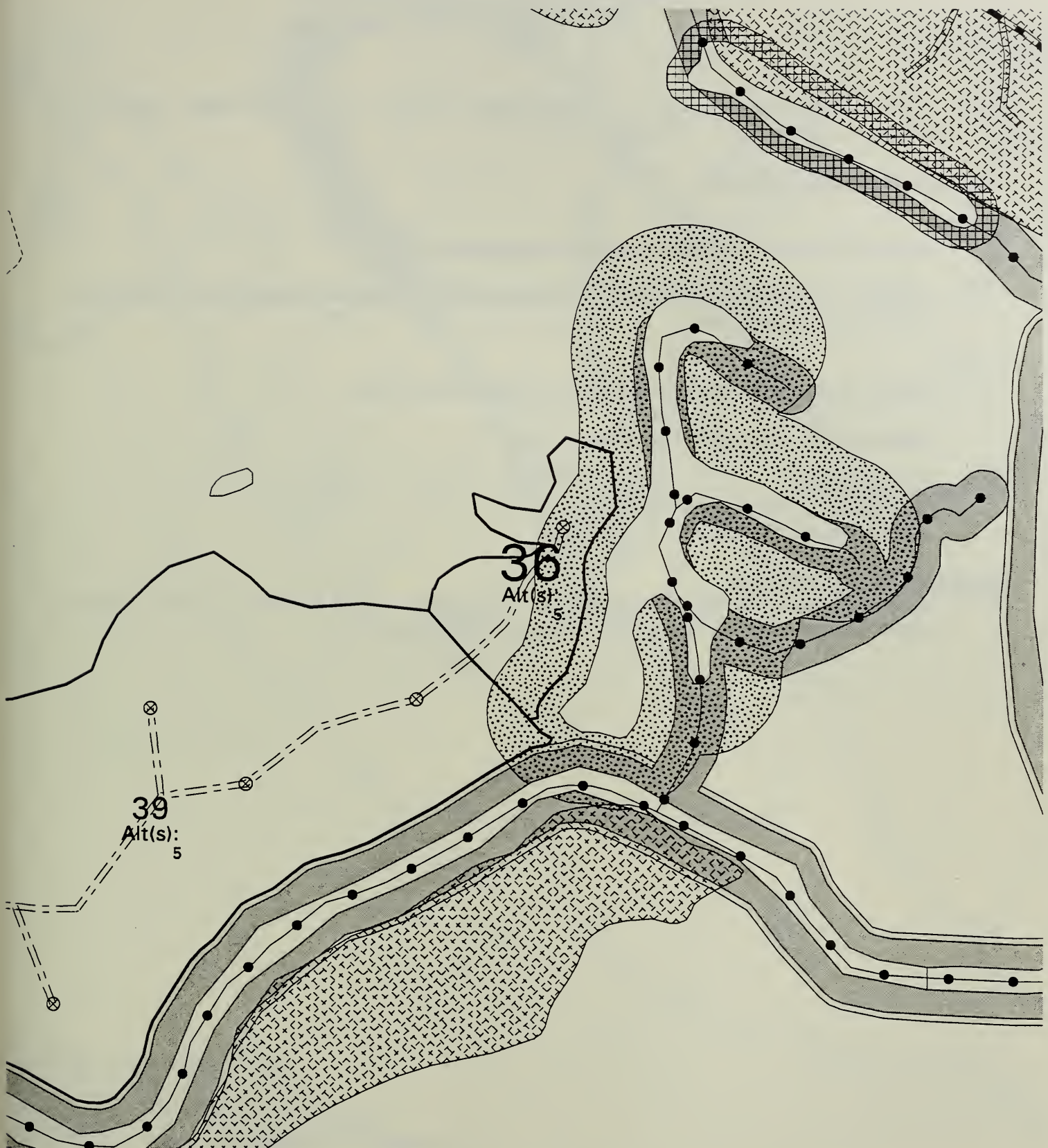
Group Selection - 40% removal (Alternative 5)

**Logging System and Unit Design**

North and east boundary follows muskeg fringe. West boundary follows forested wetland soil type. Stub temporary accesses shovel ground to minimize soil disturbance.



# Crystal Creek Timber Harvest Unit 36



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**  
**Unit 37**

Acres: 51      Alternative (s): 3 and 4      MBF Volume: 407, 136      MCF Volume: 104, 34  
1977 Aerial Photo: Flight #: 52      Photo #: 64

**Resource Concerns and Mitigation**

**Hydrology**

Concern: High Gradient Contained, Class III stream channels dissect unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Scenery**

Concern: Portion of unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

**Silvicultural Prescription**

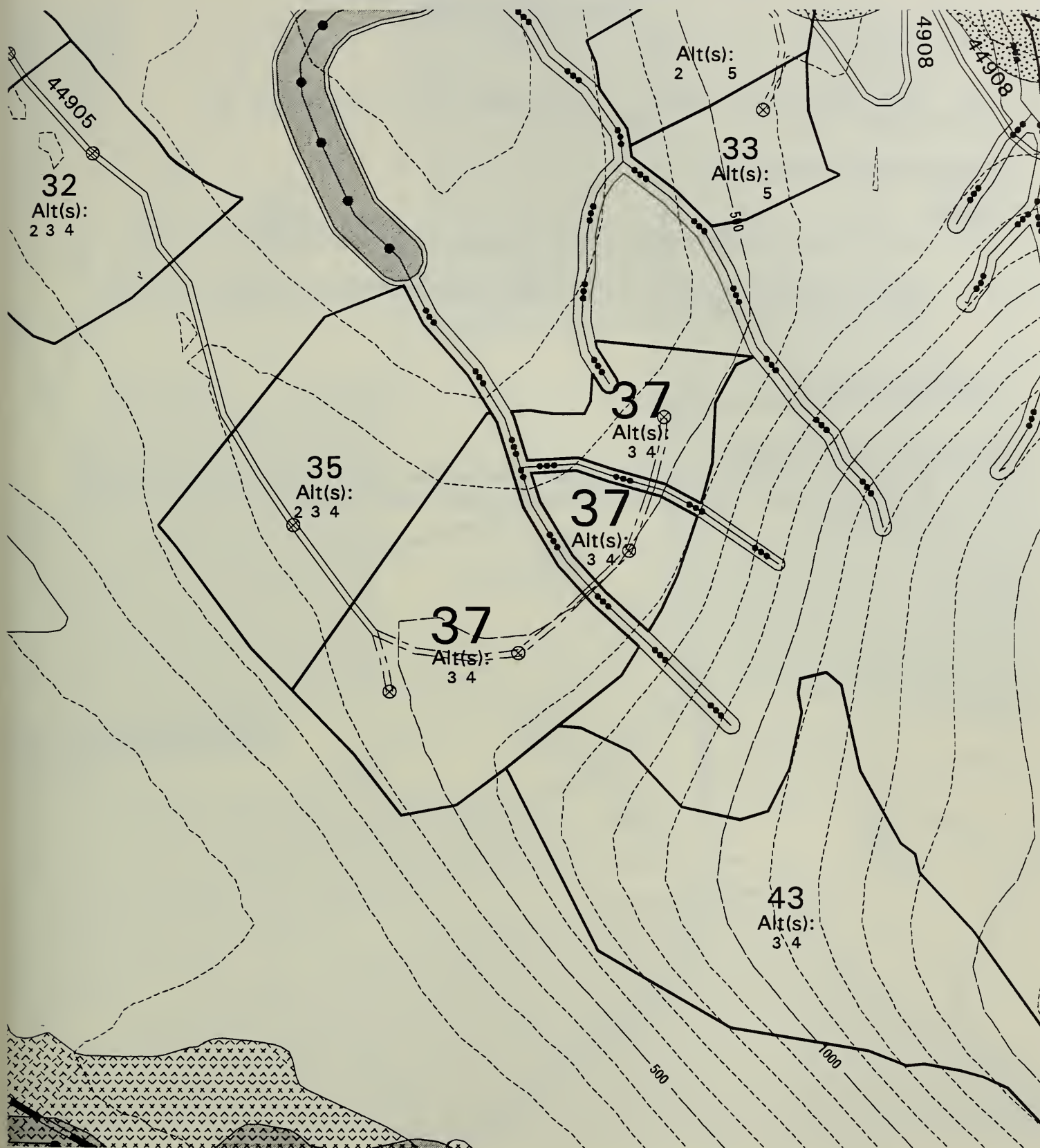
Group Selection - 30% removal (Alternative 3)

Group Selection - 10% removal (Alternative 4)

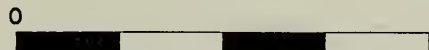
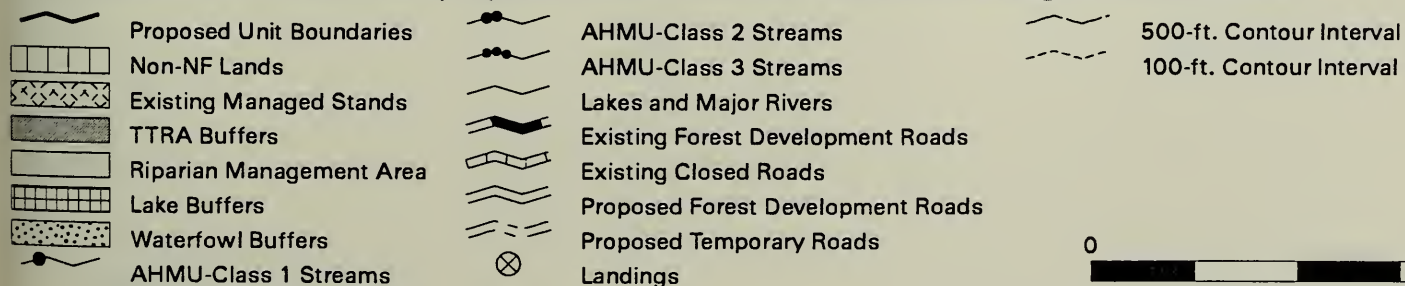
**Logging System and Unit Design**

Northeast and south boundary follow slope break. West boundary common with unit 35. Class III stream concerns mitigated by temporary road with shovel and cable yarding.

# Crystal Creek Timber Harvest Unit 37



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 38**

Acres: 21      Alternative (s): 4 and 5      MBF Volume: 116      MCF Volume: 30  
1977 Aerial Photo: Flight #: 49      Photo #: 155

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit. Active osprey nest adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling and yarding in unit during the period of April 1 and August 31.

**Silvicultural Prescription**

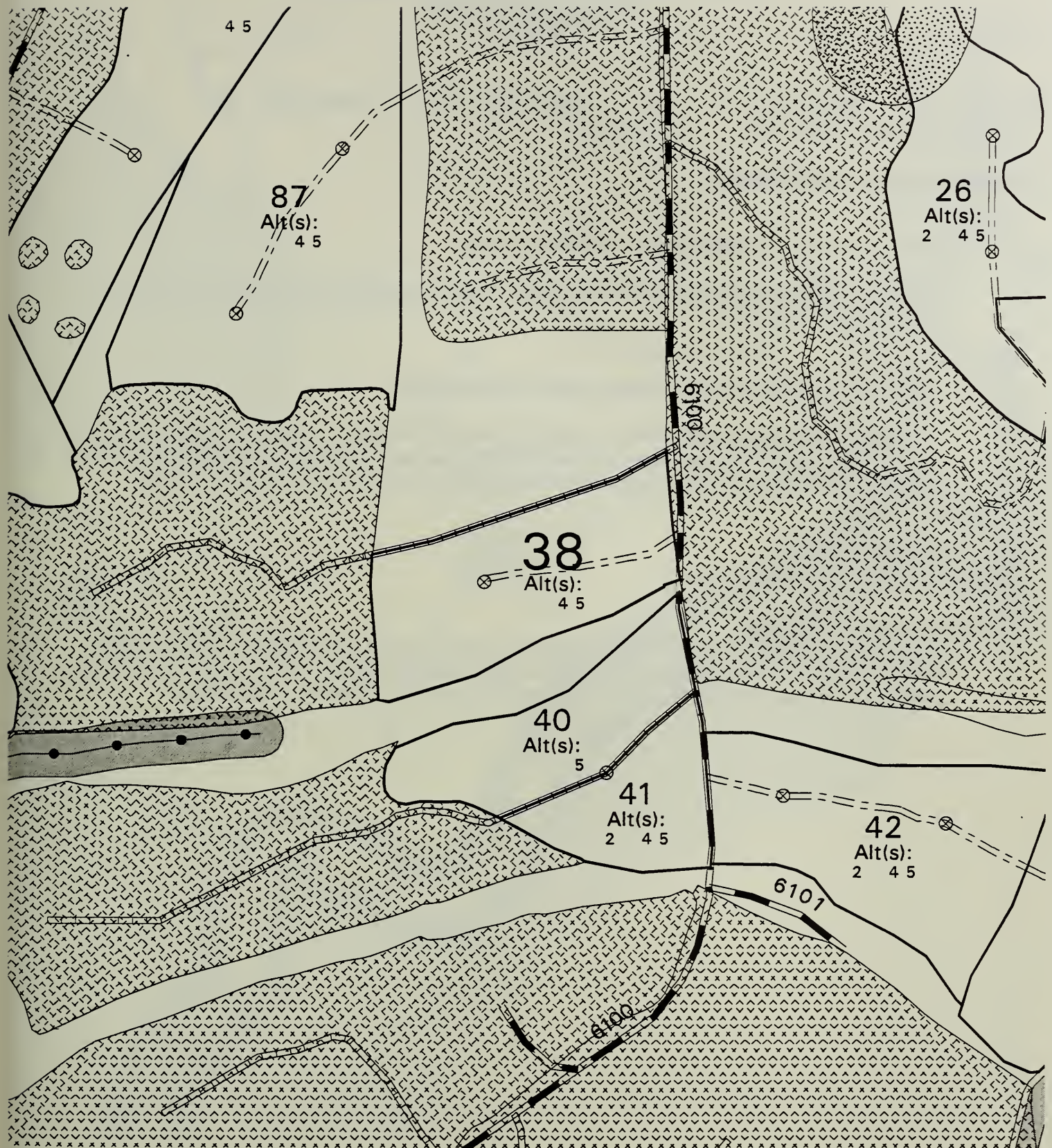
Single-tree Selection - 20% removal

**Logging System and Unit Design**

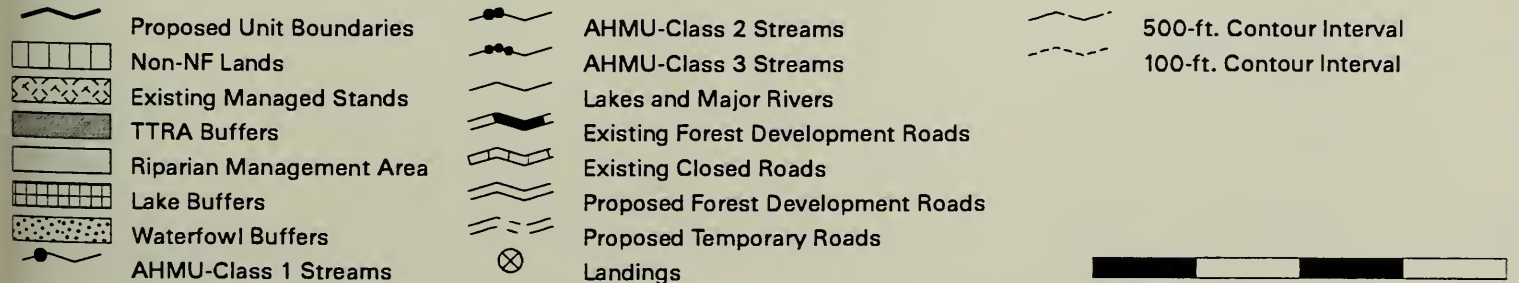
East and west boundaries follow managed stands. North boundary follows Road 6100 and south boundary follow muskeg slough. Flat ground with shovel yarding will be used. Temporary road required to minimize yarding distance.



# Crystal Creek Timber Harvest Unit 38



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 39**

Acres: 98      Alternative (s): 5  
1977 Aerial Photo: Flight #: 50

MBF Volume: 568  
Photo #: 7

MCF Volume : 30

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling and yarding in unit during the period of April 1 to July 31.

**Fisheries**

Concern: Glacier Outwash Class I stream channel south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest within the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens or 130 feet).

**Silvicultural Prescription**

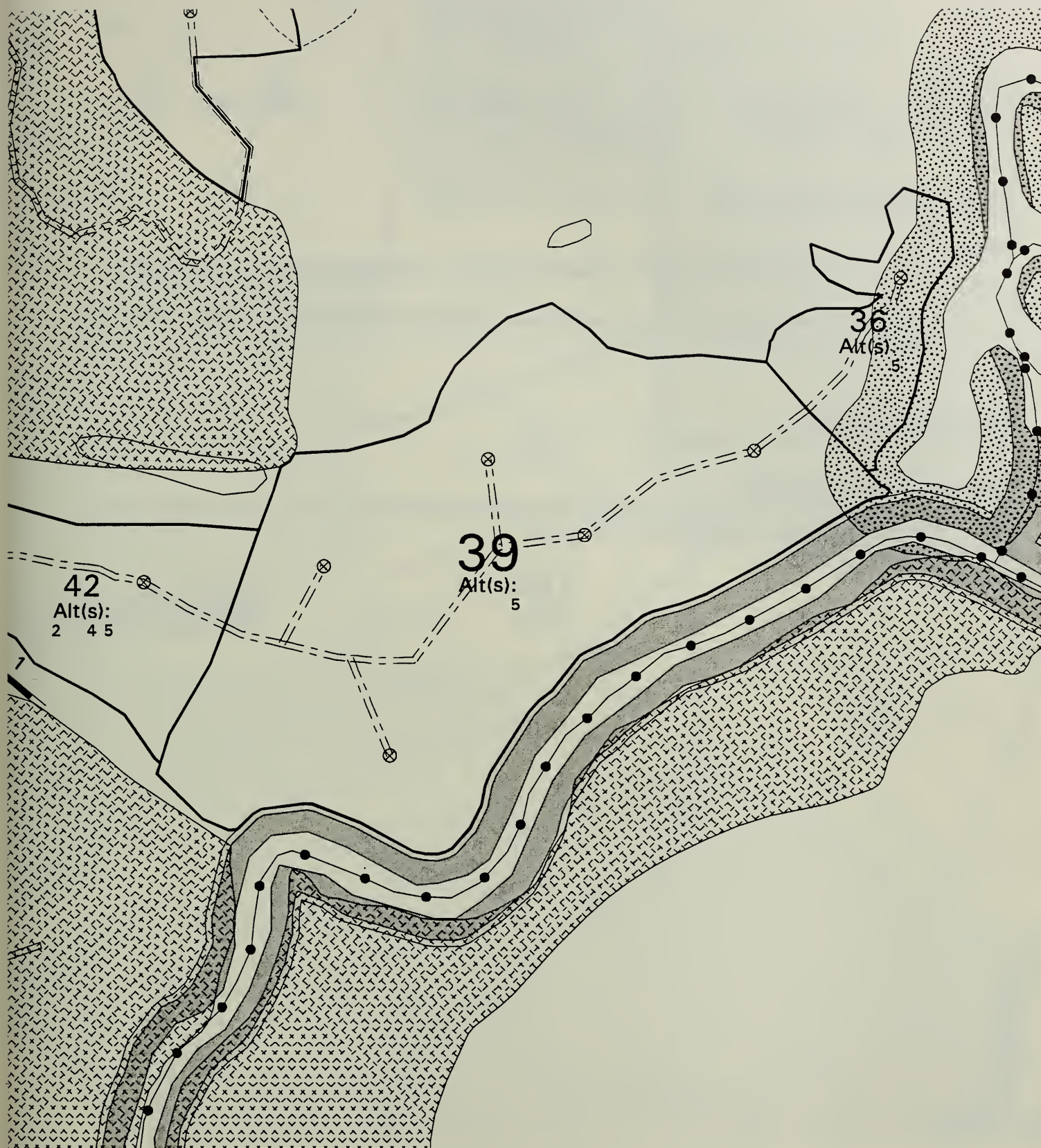
Single-tree Selection 20% removal

**Logging System and Unit Design**

North boundary follows muskeg slough to common boundary with Unit 36 on east side. South boundary follows Muddy River plus 100 foot buffer. West boundary common with Unit 42. Flat ground with shovel yarding will be used. Temporary road required to minimize yarding distance for future entries.



# Crystal Creek Timber Harvest Unit 39



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 40**

Acres: 14      Alternative (s): 5  
1977 Aerial Photo: Flight #: 49

MBF Volume: 75  
Photo #:155

MCF Volume : 19

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit. Active osprey nest adjacent to the unit.

Mitigation: Use single-tree selection harvest method. Prohibit tree falling and yarding in unit during the period April 1 to August 31.

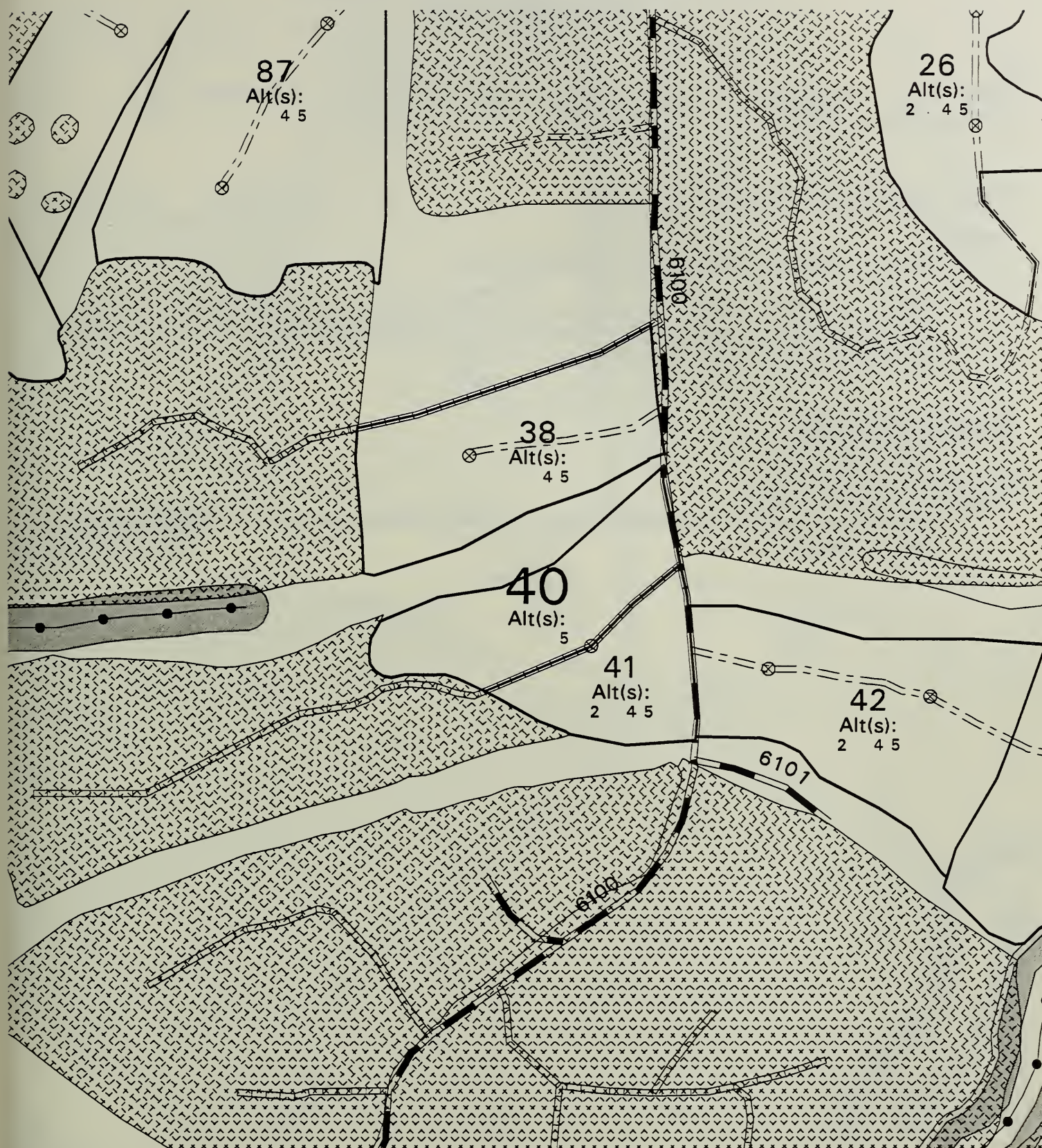
**Silvicultural Prescription**

Single-tree Selection- 20% removal

**Logging System and Unit Design**

North boundary follows muskeg slough. East and west boundary follows managed stands. South boundary follows specified road. Shovel yarding will be used.

# Crystal Creek Timber Harvest Unit 40



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**  
**Unit 41**

Acres: 10      Alternative (s): 2, 4, and 5  
1977 Aerial Photo: Flight #:49      Photo #:155

MBF Volume: 214

MCF Volume : 54

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Prohibit tree falling and yarding in unit during the period of April 1 to July 31. Top one large-diameter tree per three acres in clearcut portion of unit for future goose nest platforms and retain at least three large dead and dying trees/acre where feasible.

**Silvicultural Prescription**

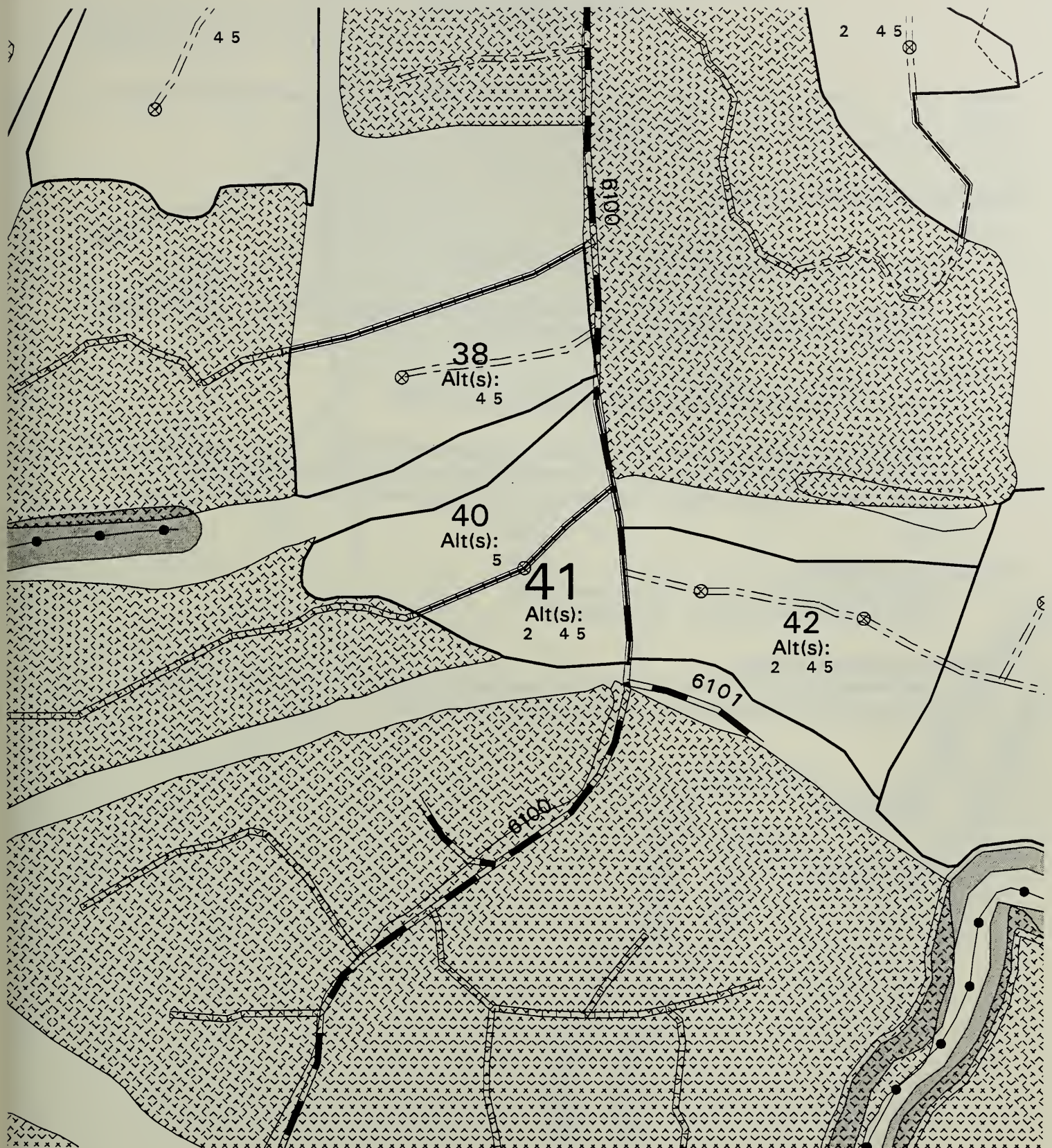
Clearcut with reserves

**Logging System and Unit Design**

North and east boundary follows specified roads. South and southwest boundary follows managed stands. Shovel yarding will be used.



# Crystal Creek Timber Harvest Unit 41



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

**Crystal Creek Unit Card**  
**Unit 42**

Acres: 26      Alternative (s): 2, 4, and 5  
55, 73

MBF Volume: 218, 218, and 290    MCF Volume : 55,

1977 Aerial Photo: Flight #: 50

Photo #: 7

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goose nesting likely within or adjacent to the unit.

Mitigation: Use group selection harvest concentrating on salvage harvest of blowdown. Forest adjacent to beaver slough to the north of the unit deferred from harvest.

**Fisheries**

Concern: Glacier Outwash Class I stream channel south of the unit.

Mitigation: No commercial timber harvest within 100 feet of stream channel. No commercial timber harvest within the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens or 130 feet).

**Silvicultural Prescription**

Group Selection 30% removal    (Alternative 2 and 4)

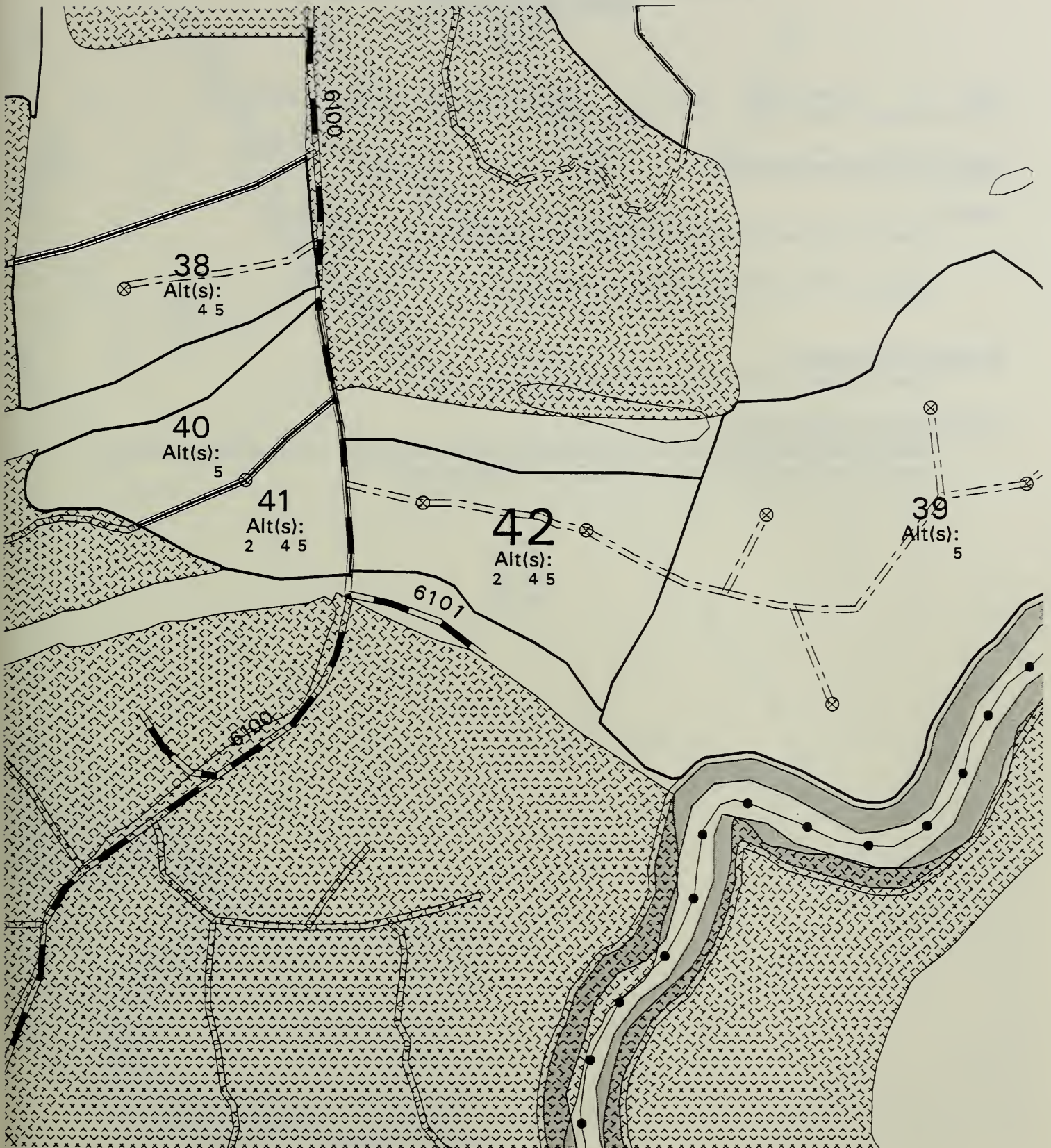
Group Selection - 40% removal    (Alternative 5)

**Logging System and Unit Design**

West boundary along road 6100. East boundary along unit 39. North boundary along beaver slough. Managed stand to the south of the unit. Shovel yarding will be used.



# Crystal Creek Timber Harvest Unit 42



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**  
**Unit 43**

Acres: 54      Alternative (s): 3 and 4      MBF Volume: 154      MCF Volume : 39  
1977 Aerial Photo: Flight #: 53      Photo #: 97

**Resource Concerns and Mitigation**

**Scenery**

Concern: Unit visible from Frederick Sound and Thomas Bay.

Mitigation: Unit as designed addresses scenic concern.

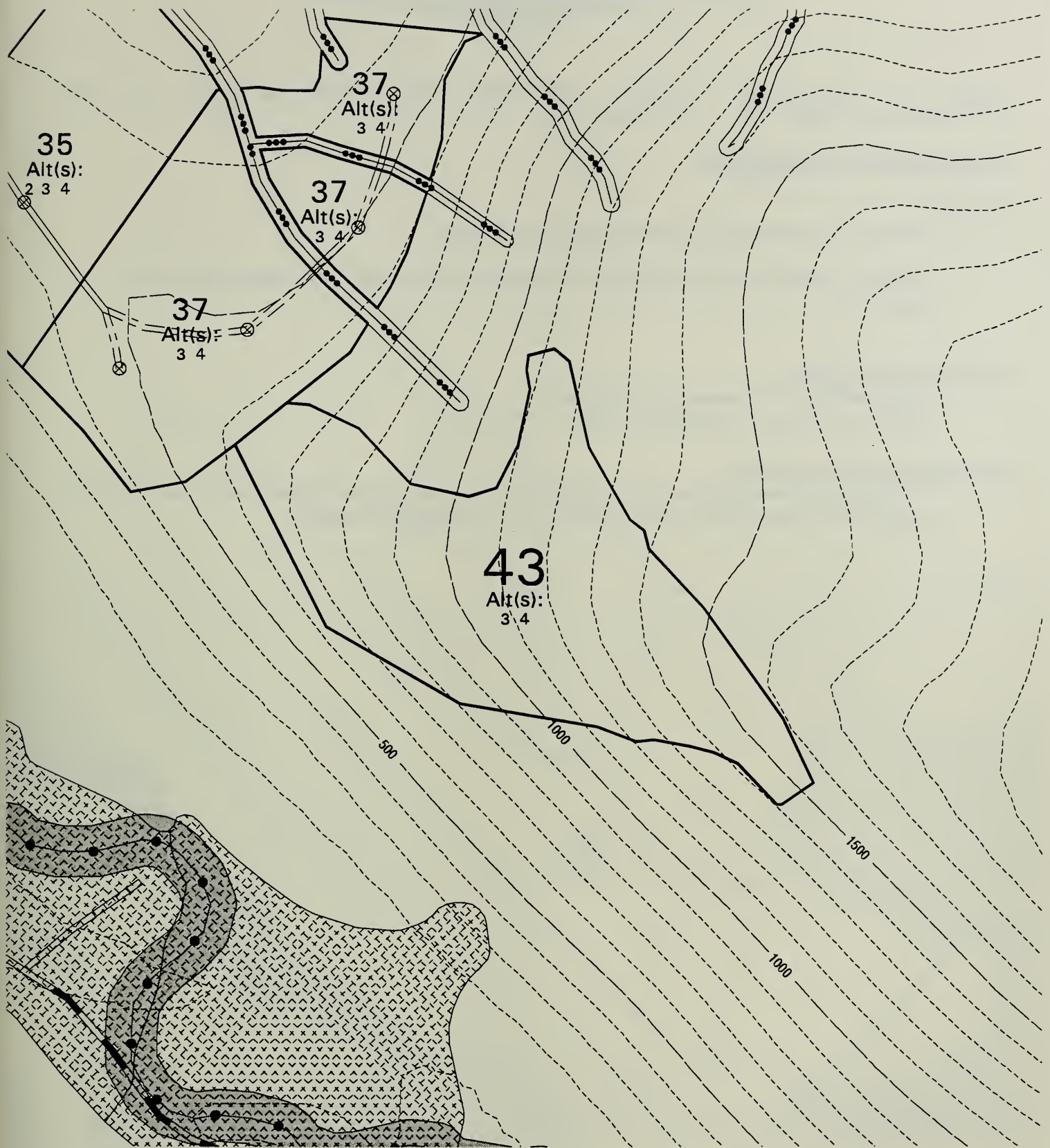
**Silvicultural Prescription**

Group Selection - 10% removal (Alternative 3 and 4)

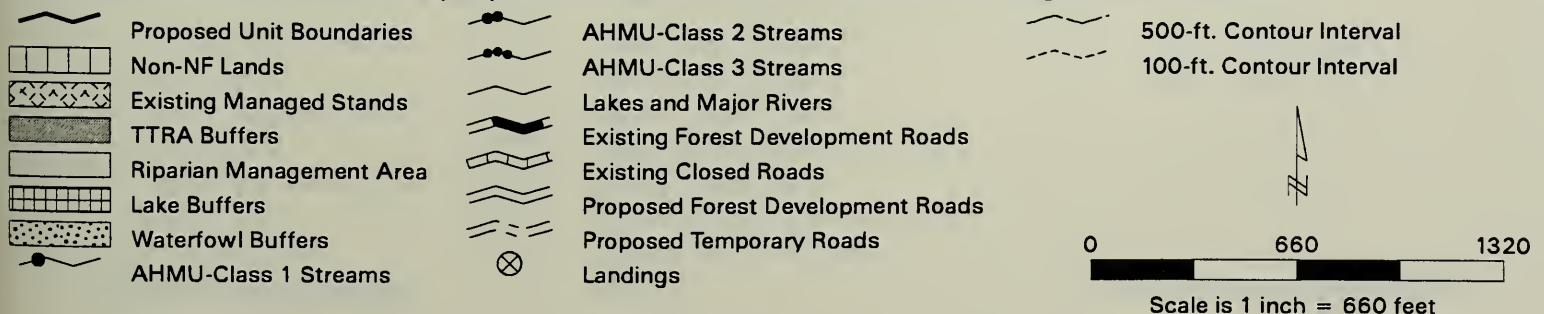
**Logging System and Unit Design**

Southwest boundary follows slope contours avoiding extreme hazard soils. Northeast boundary follows muskeg. Unit is planned for helicopter yarding to landing in unit 37.

# Crystal Creek Timber Harvest Unit 43



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**

**Unit 44**

Acres: 28      Alternative (s): 2, 4, and 5      MBF Volume: 235, 666, and 666      MCF Volume: 60, 171, 171  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Scenery**

Concern: Upper portion of unit visible from Frederick Sound.

Mitigation: Undulate backline and upper 1/3 of northwest boundary line to eliminate straight edge appearance.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 2)

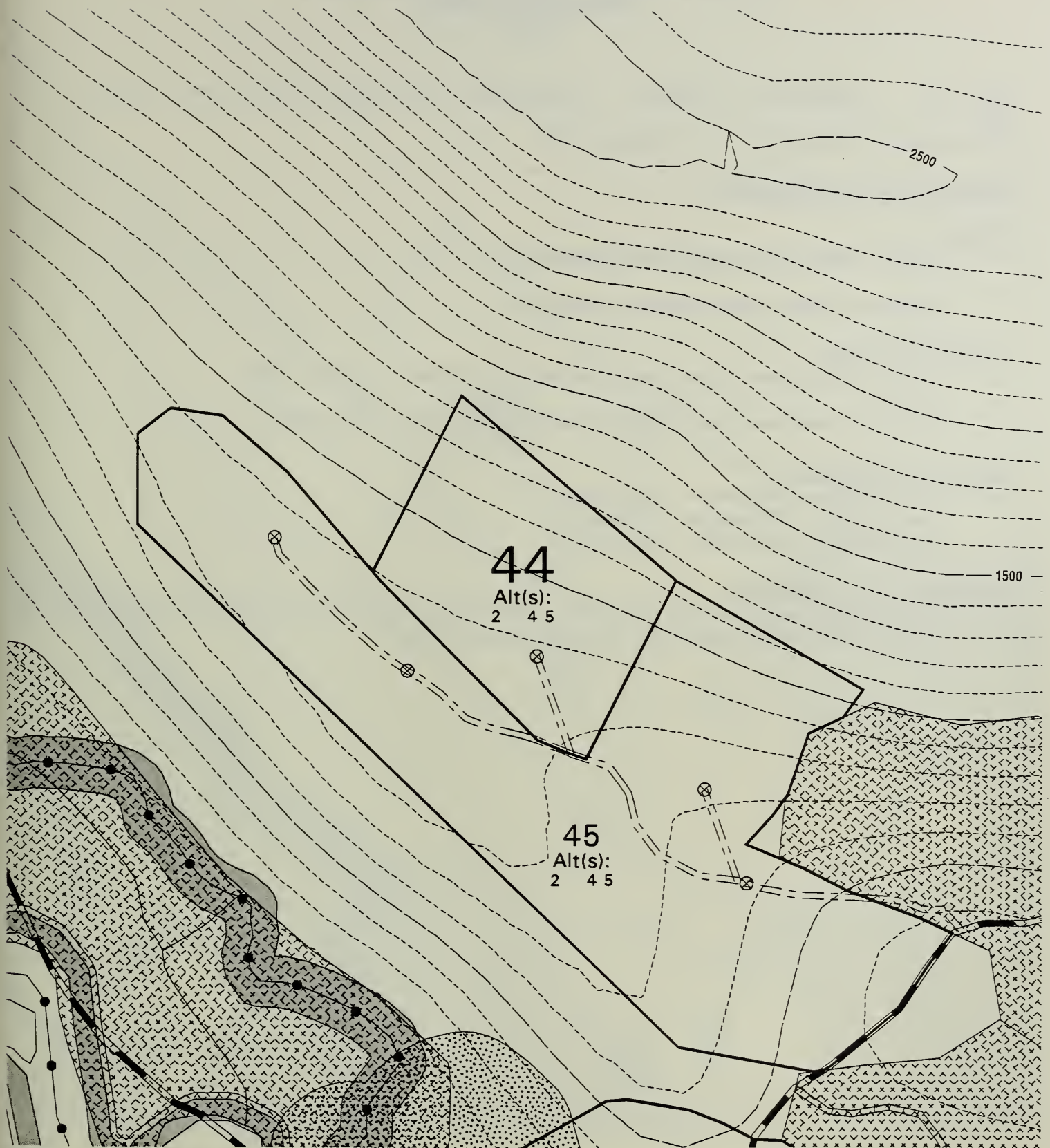
Clearcut with reserves - (Alternative 3 and 5)

**Logging System and Unit Design**

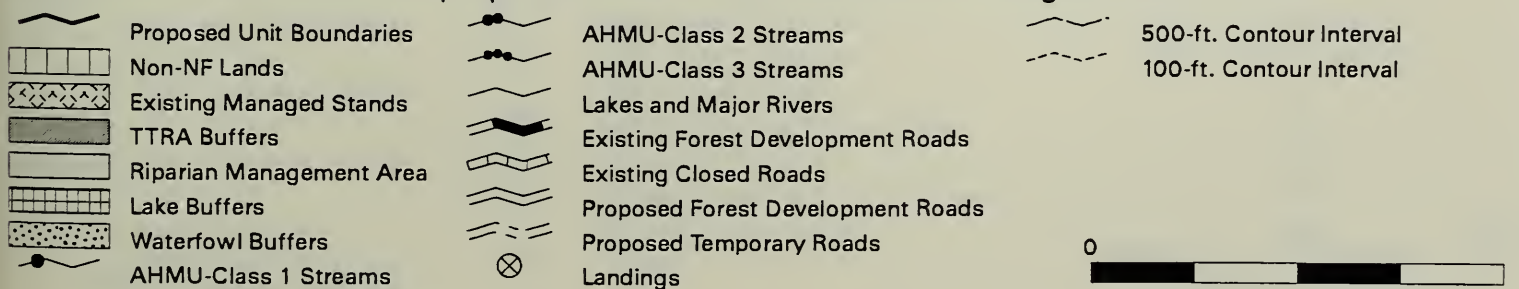
North and west boundary follows slope breaks avoiding oversteepened and isolated areas of steep slope. The south and east boundaries are common with Unit 45. Cable logging is planned.



# Crystal Creek Timber Harvest Unit 44



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 45**

Acres: 89      Alternative (s): 2, 4, and 5      MBF Volume: 748, 249, and 997    MCF Volume : 192, 131, 256  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Scenery**

Concern: Portion of unit visible from Frederick Sound.

Mitigation: Unit as designed addresses scenic concern.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located along the west-central boundary of unit.

Mitigation: Retain some trees on landslide-prone terrain to maintain slope stability.

**Silvicultural Prescription**

Group Selection - 30% removal    (Alternative 2)

Group Selection - 10% removal    (Alternative 4)

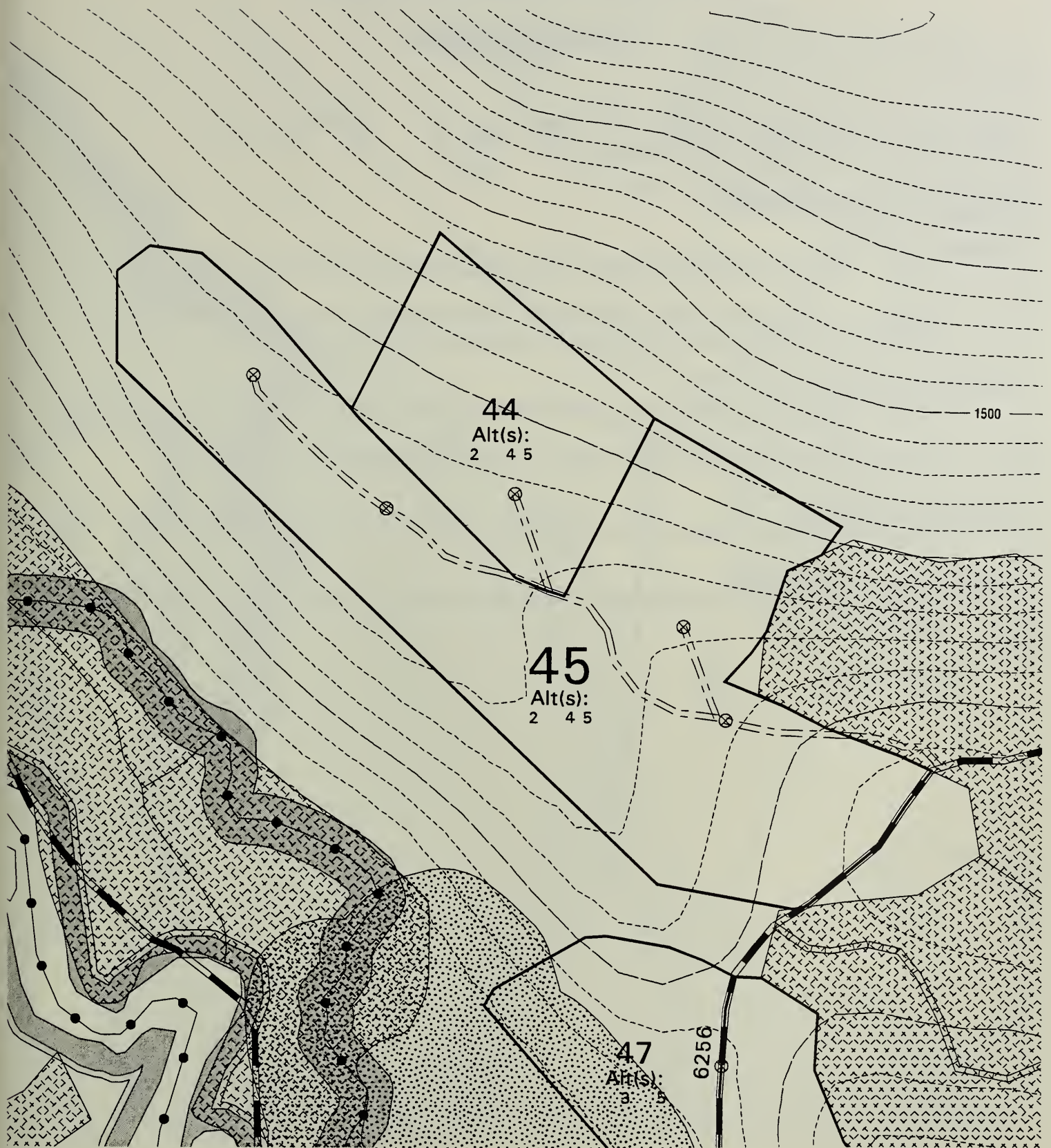
Group Selection - 40% removal    (Alternative 5)

**Logging System and Unit Design**

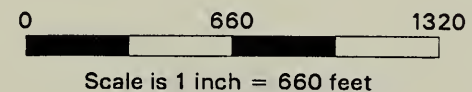
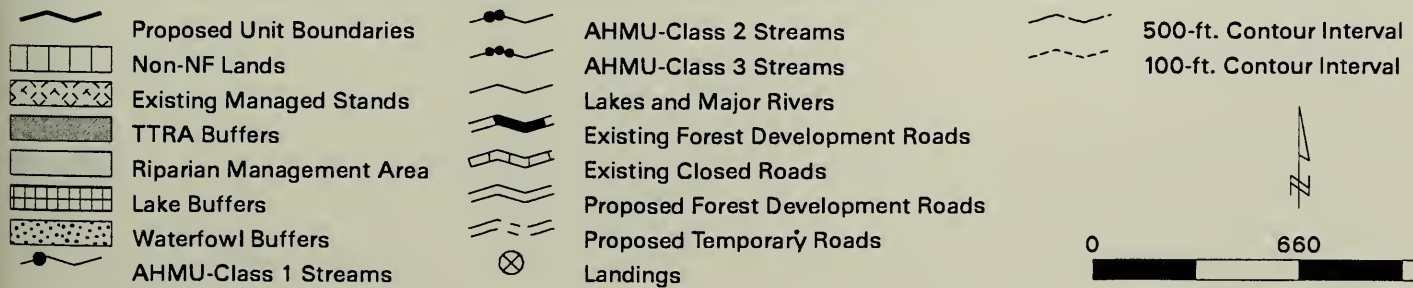
West and south boundaries follow slope breaks. North boundary common with unit 44 and avoids unstable slopes. Combination of mobile yarder and shovel logging within unit.



# Crystal Creek Timber Harvest Unit 45



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 47**

Acres: 22      Alternative (s): 3 and 5      MBF Volume: 464      MCF Volume : 121  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Waterfowl nesting likely within unit or in wetlands adjacent to western edge of unit.

Mitigation: Restrict harvest within waterfowl buffer to 40% maximum removal of basal area this entry.  
Prohibit tree falling and yarding within the buffer during the period of April 1 to July 31.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the western half of the unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

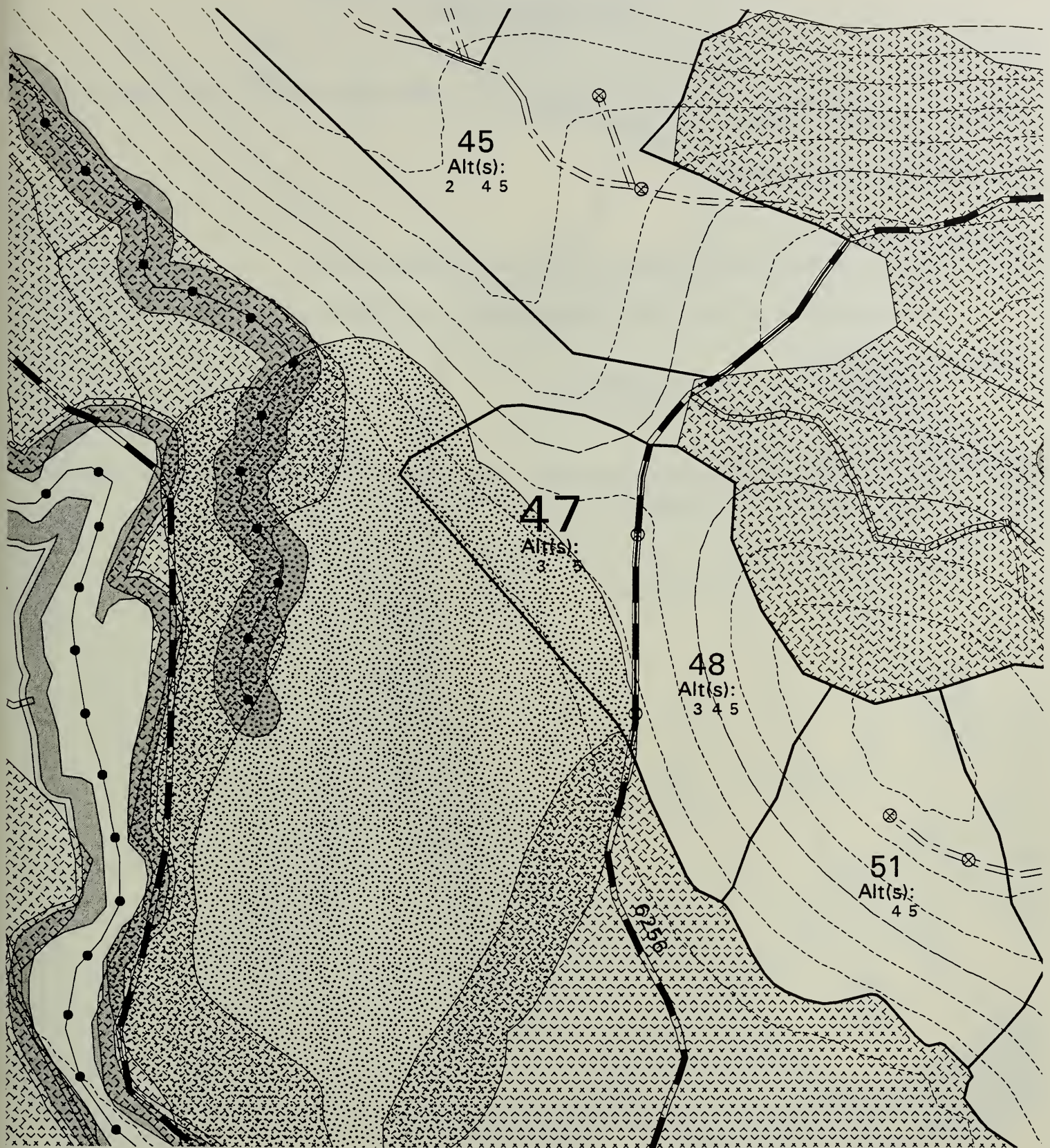
**Silvicultural Prescription**

Clearcut with Reserves. Restrict harvest to 40% removal of basal area within the waterfowl buffer.

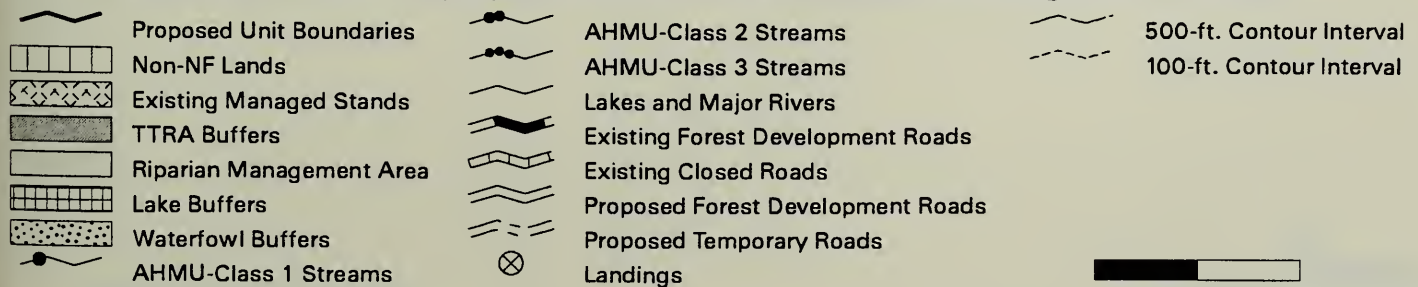
**Logging System and Unit Design**

Southwest boundary follows muskeg break. East boundary follows Road 6256. Cable yarding from existing specified roads.

# Crystal Creek Timber Harvest Unit 47



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 48**

Acres: 26      Alternative (s): 3, 4, and 5      MBF Volume: 616, 73, and 616      MCF Volume : 157, 19, 157  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the central portion of the unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Clearcut with reserves (Alternative 3 and 5)

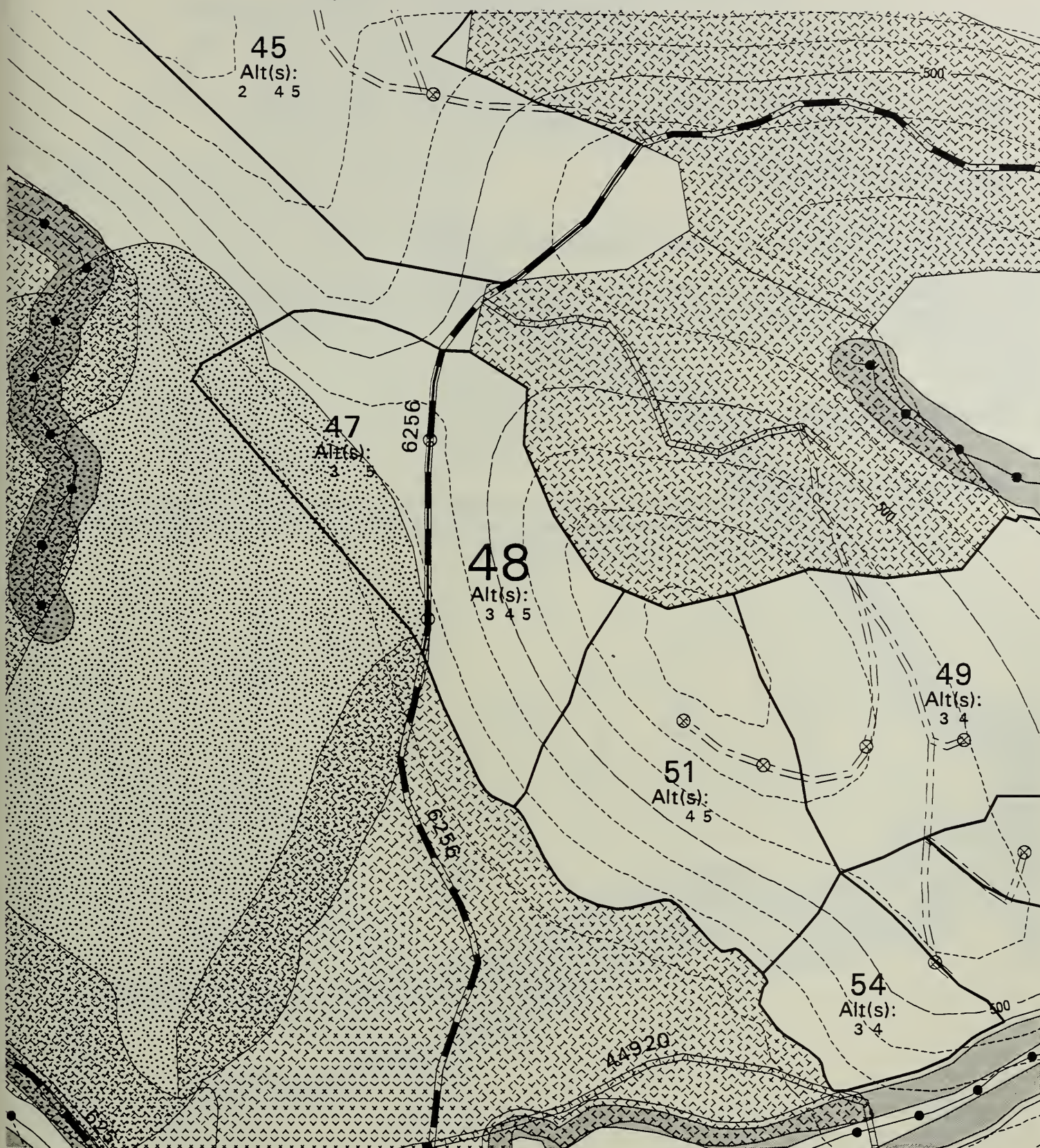
Group Selection - 10% removal (Alternative 4)

**Logging System and Unit Design**

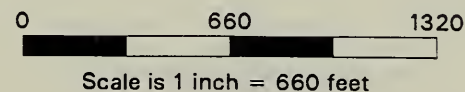
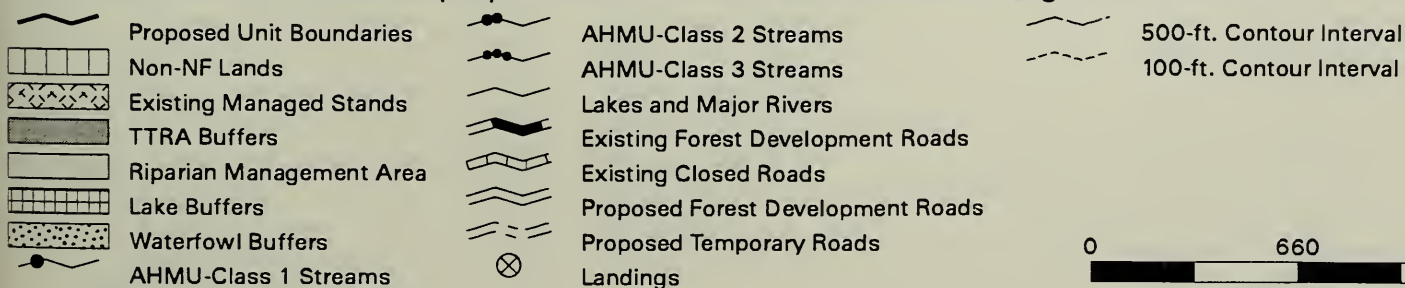
North and south boundaries follows managed stands. West boundary follows Road 6256 and east boundary is common with unit 51. Cable logging from existing specified road.



# Crystal Creek Timber Harvest Unit 48



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 49**

Acres: 48      Alternative (s): 3 and 4      MBF Volume: 1159      MCF Volume : 288  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Palustrine, Class I stream channel northeast of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils or riparian associated wetland fens).

**Silvicultural Prescription**

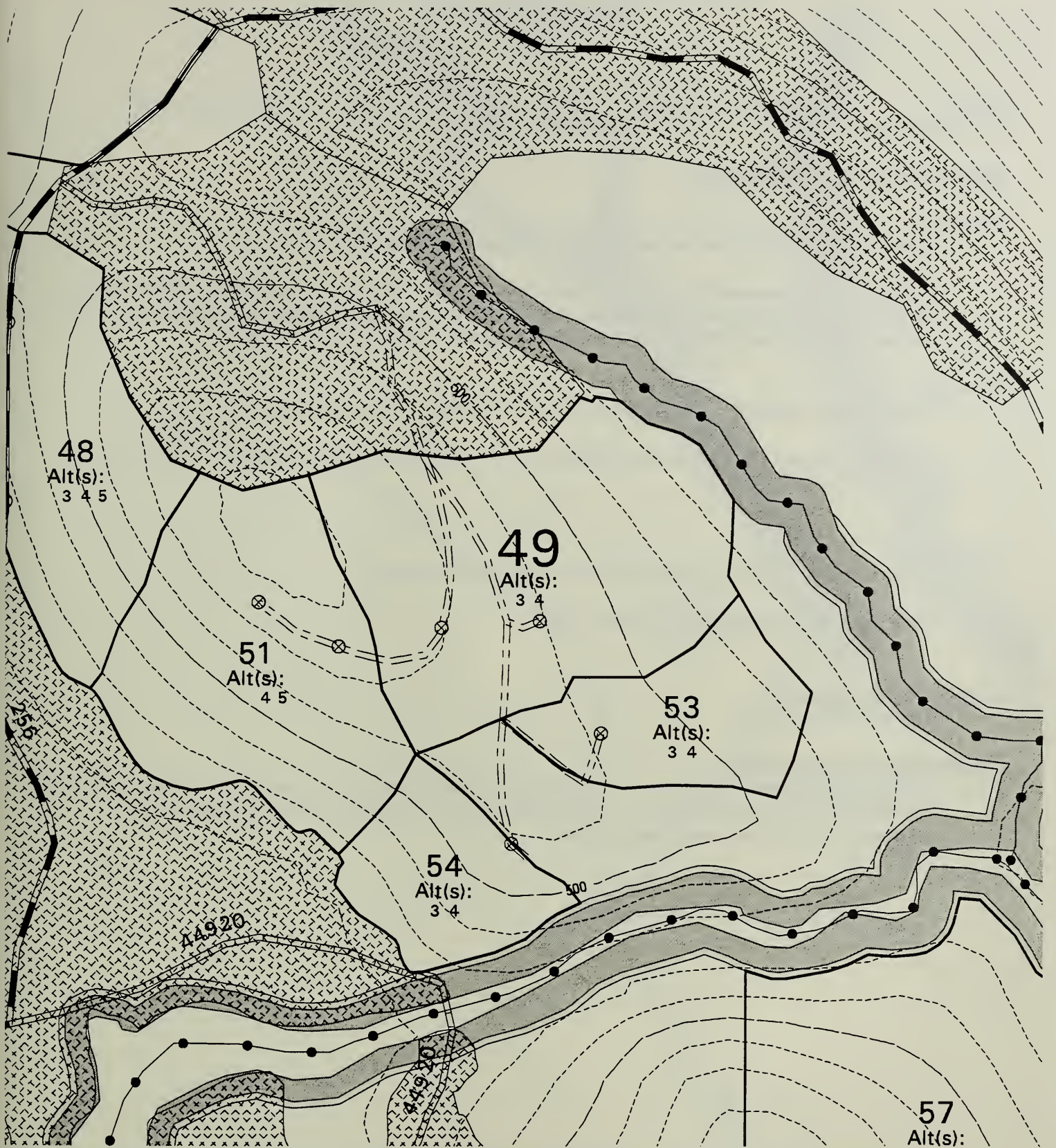
Clearcut with reserves

**Logging System and Unit Design**

North boundary follows managed stands. East boundary follows slope break above Class I stream maintain windfirm buffer. South and west boundaries common with Units 53 and 51. Multiple temporary roads which access other units will be used. Cable logging is planned.



# Crystal Creek Timber Harvest Unit 49



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Scale 0 660 1320



**Crystal Creek Unit Card**

**Unit 50**

Acres: 51      Alternative (s): 2, 3, and 4

MBF Volume: 1170

MCF Volume : 321

1977 Aerial Photo: Flight #: 53

Photo #: 99

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Flood Plain, Class I stream channel to the northeast of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest in the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of the flood plain, riparian vegetation or soils, riparian associated wetland fens or 130 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channel to the southwest of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Wetlands**

Concern: Forest wetland, maybeso series soils, along southwest border.

Mitigation: Unit is designed to avoid these soils.

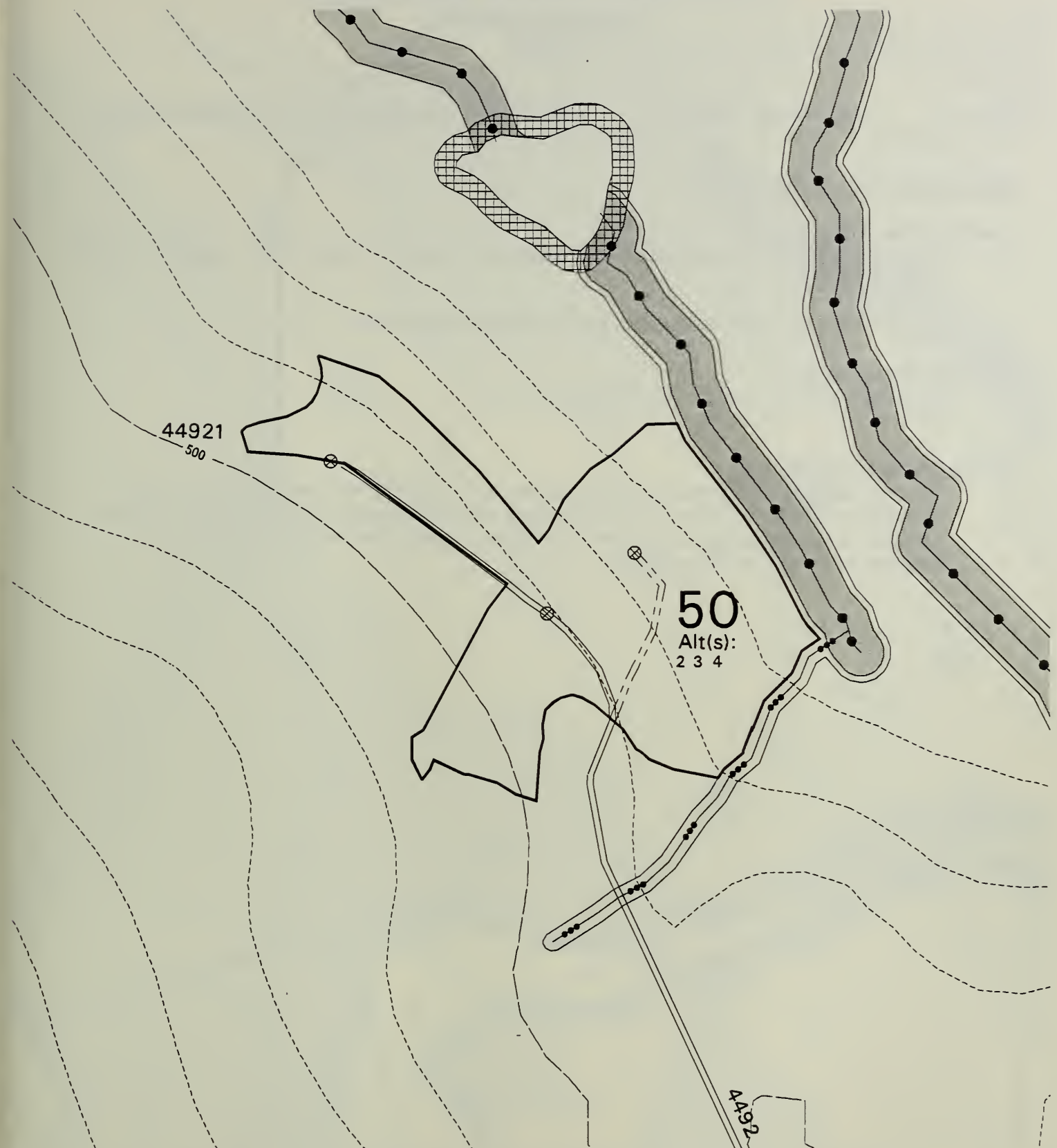
**Silvicultural Prescription**

Clearcut with reserves

**Logging System and Unit Design**

Unit boundary follows Class I stream to the north and a Class III stream to the east. The south and southwest boundaries follow forest wetland soils. A combination of cable and shovel yarding will minimize soil disturbance. A short temporary road is planned.

# Crystal Creek Timber Harvest Unit 50



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320

Scale is 1 inch = 660 feet

**Crystal Creek Unit Card**  
**Unit 51**

Acres: 37      Alternative (s): 4 and 5      MBF Volume: 93 and 370      MCF Volume : 25 and 99  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the central (extreme landslide hazard) and southern portion of the unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

**Silvicultural Prescription**

Group Selection 10% removal (Alternative 4)

Group Selection 40% removal (Alternative 5)

**Logging System and Unit Design**

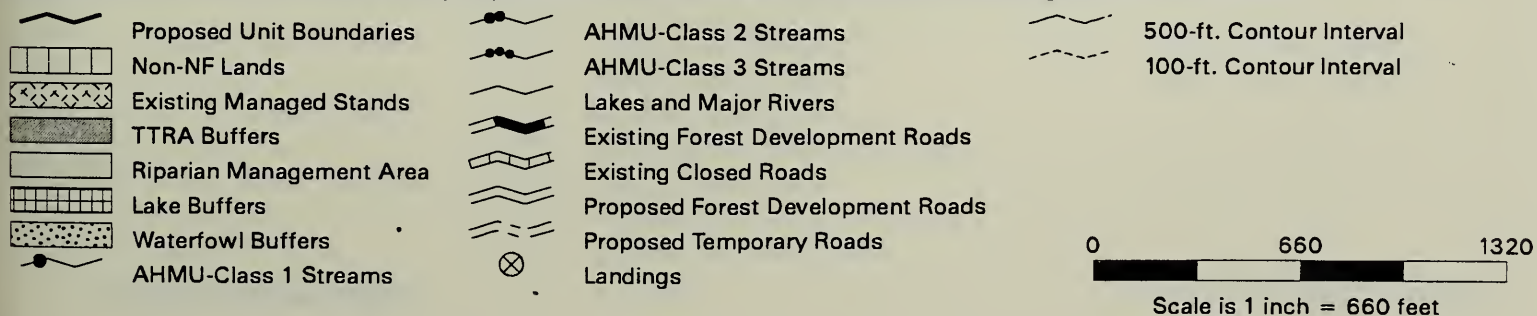
The north and south boundaries follows managed stands. The east and west boundaries have common boundaries with Units 48, 49, and 54. A skyline cable system plus a short temporary road are planned for Alternative 5 to minimize ground disturbance. Helicopter logging is planned for Alternative 4; the temporary road would not be constructed.



# Crystal Creek Timber Harvest Unit 51



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**

**Unit 53**

Acres: 16      Alternative (s): 3 and 4      MBF Volume: 394 and 46      MCF Volume: 101 and 12  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Silvicultural Prescription**

Clearcut with reserves (Alternative 3)

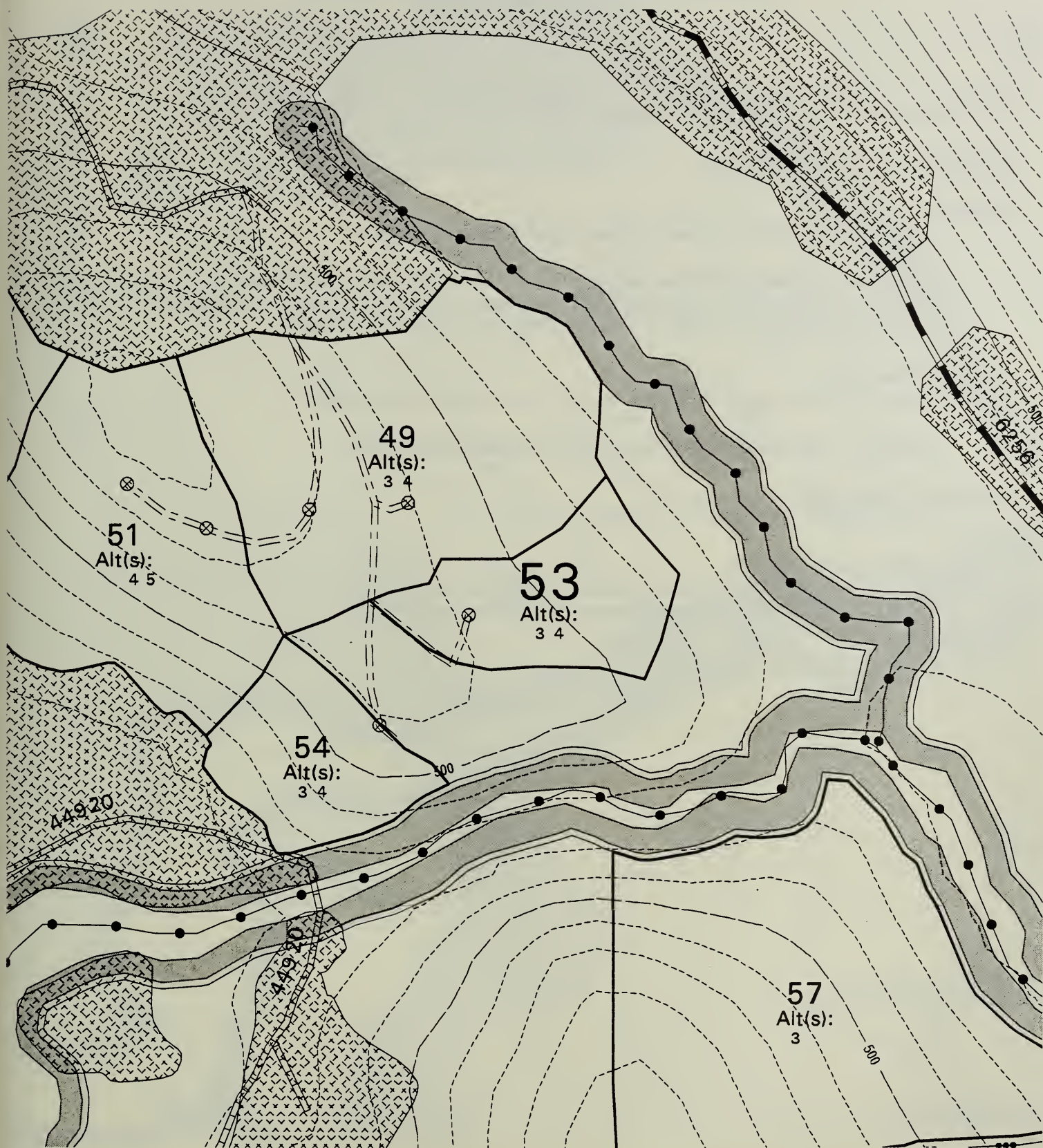
Group Selection 10% removal (Alternative 4)

**Logging System and Unit Design**

The north, east and south boundary follow slope breaks. The west boundary is common with Unit 49. A short temporary road will minimize cable yarding distance.



# Crystal Creek Timber Harvest Unit 53



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |





**Crystal Creek Unit Card**  
**Unit 54**

Acres: 14      Alternative (s): 3 and 4      MBF Volume: 41      MCF Volume : 10  
1977 Aerial Photo: Flight #: 54      Photo #: 158

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Glacial Outwash, Class I stream channel to the south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens or 130 feet). Directional fall trees away from the channel.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the northwest corner of unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

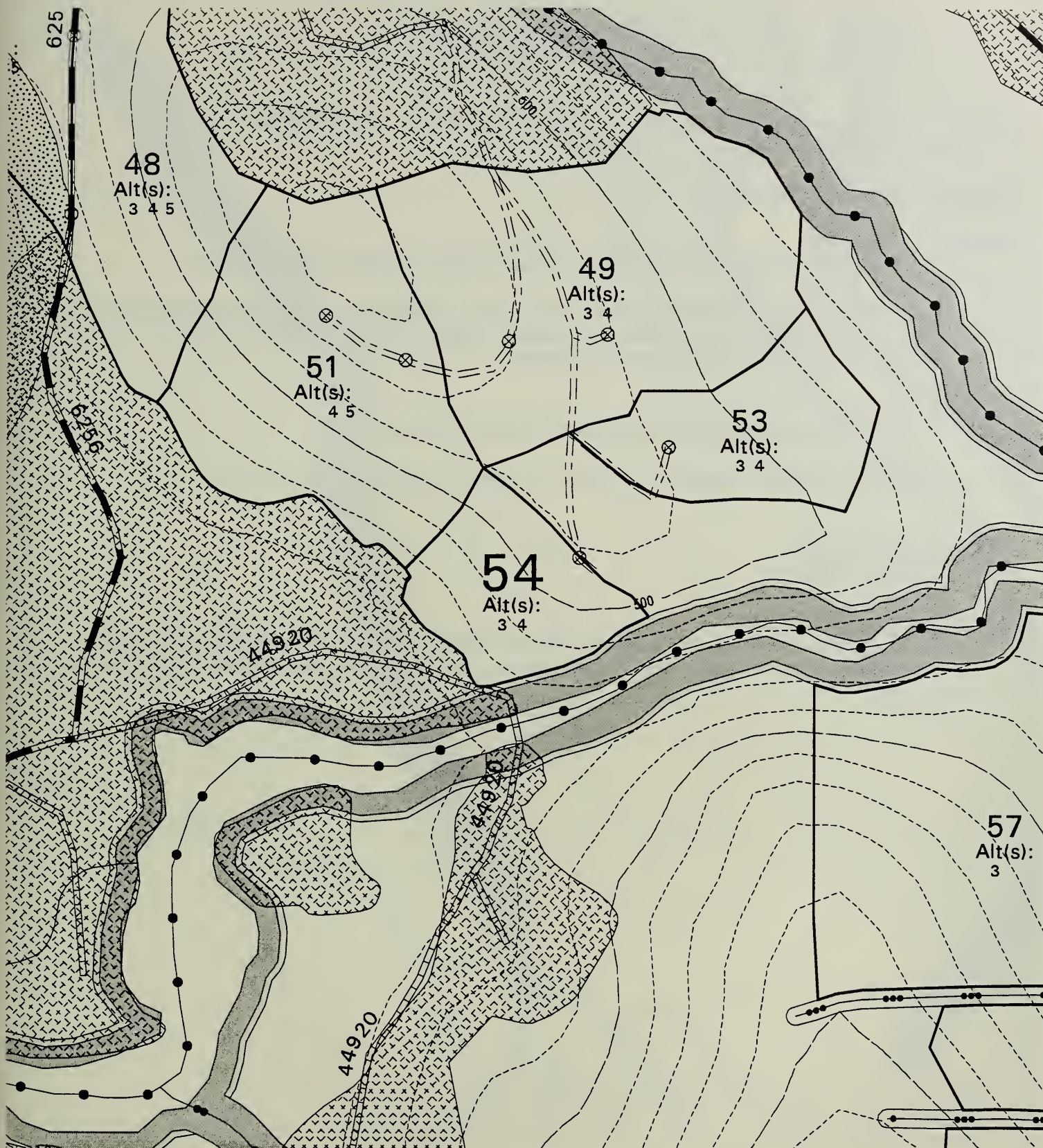
**Silvicultural Prescription**

Group Selection - 10% removal (Alternative 3 and 4)

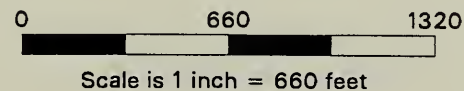
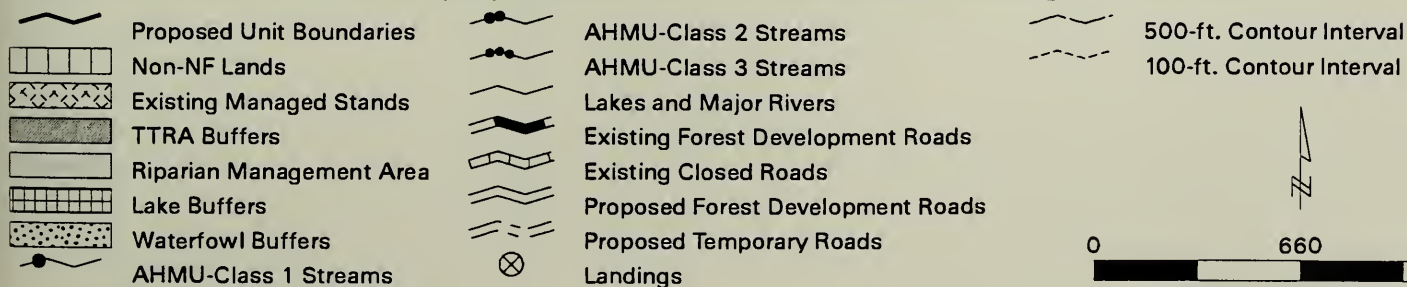
**Logging System and Unit Design**

The west boundary follows a managed stand and the south boundary follows a Class I stream buffer. A short temporary road is required to access unit and utilize cable logging system.

# Crystal Creek Timber Harvest Unit 54



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 55**

Acres: 45      Alternative (s): 2 and 4      MBF Volume: 956      MCF Volume : 260  
1977 Aerial Photo: Flight #: 53      Photo #: 100

**Resource Concerns and Mitigation**

**Fisheries**

Concern: High Gradient Contained Class I and Class II stream channel to the east of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located along eastern boundary.

Mitigation: The unit is designed to avoid slopes exceeding 75% along the eastern border.

**Silvicultural Prescription**

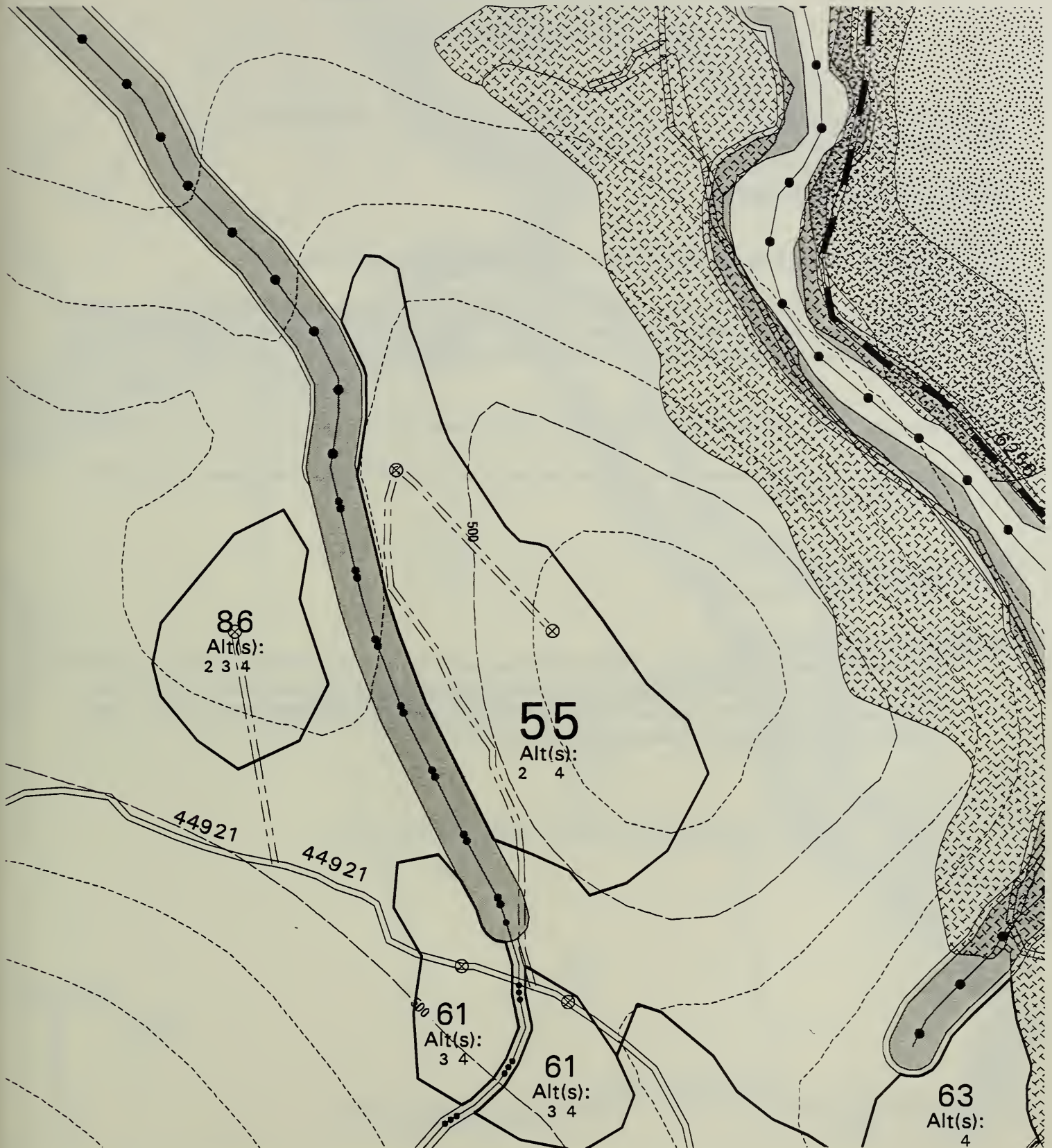
Clearcut with reserves

**Logging System and Unit Design**

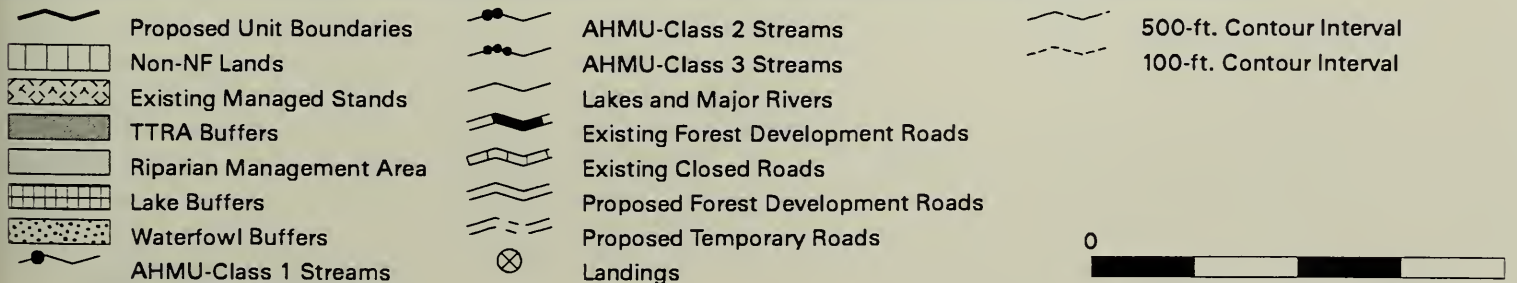
Unit is designed to follow a Class II stream plus 100 foot buffer on the west boundary and follows slope breaks on the other three sides. A spur road is planned to access unit with shovel and cable logging planned.



# Crystal Creek Timber Harvest Unit 55



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**

**Unit 57**

Acres: 79      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 226  
Photo #: 174

MCF Volume: 58

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Glacial Outwash, Class I stream channel to the west and north of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest in the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 130 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channels within the unit and to the south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area defined as the V-notch (side-slope break).

**Silvicultural Prescription**

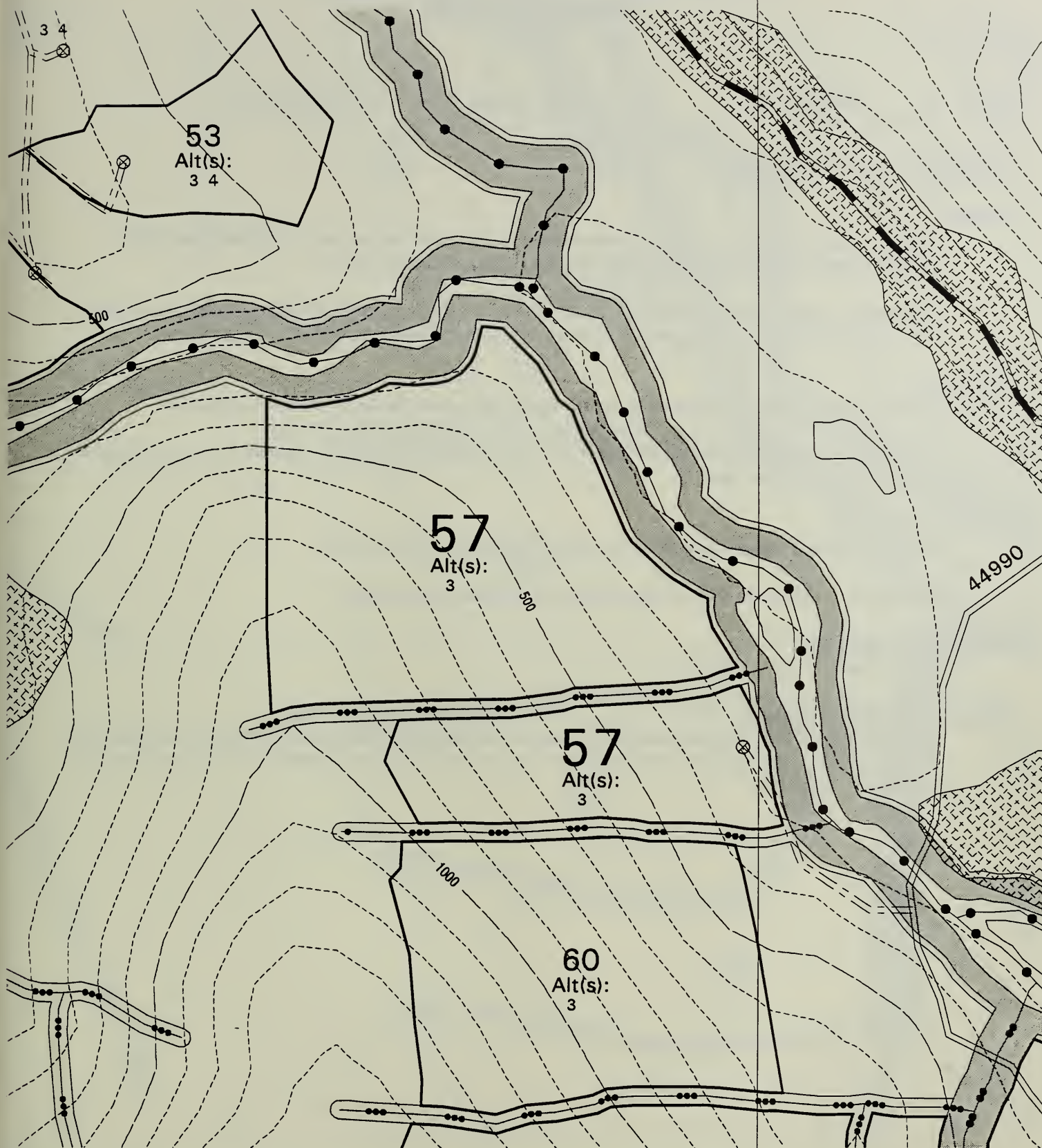
Group Selection - 10% removal

**Logging System and Unit Design**

Follow slope break plus 100 feet for TTRA buffer along north and east boundary which is adjacent to Class I stream. South boundary is above v-notch Riparian Management Area and follows and follow ridge break along west boundary. Unit is planned for helicopter logging with some cable harvesting possible. A stub temporary road is planned to access southeast corner of unit.



# Crystal Creek Timber Harvest Unit 57



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**  
**Unit 60**

Acres: 44      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 370  
Photo #: 174

MCF Volume: 96

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the unit.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the southern portion of unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

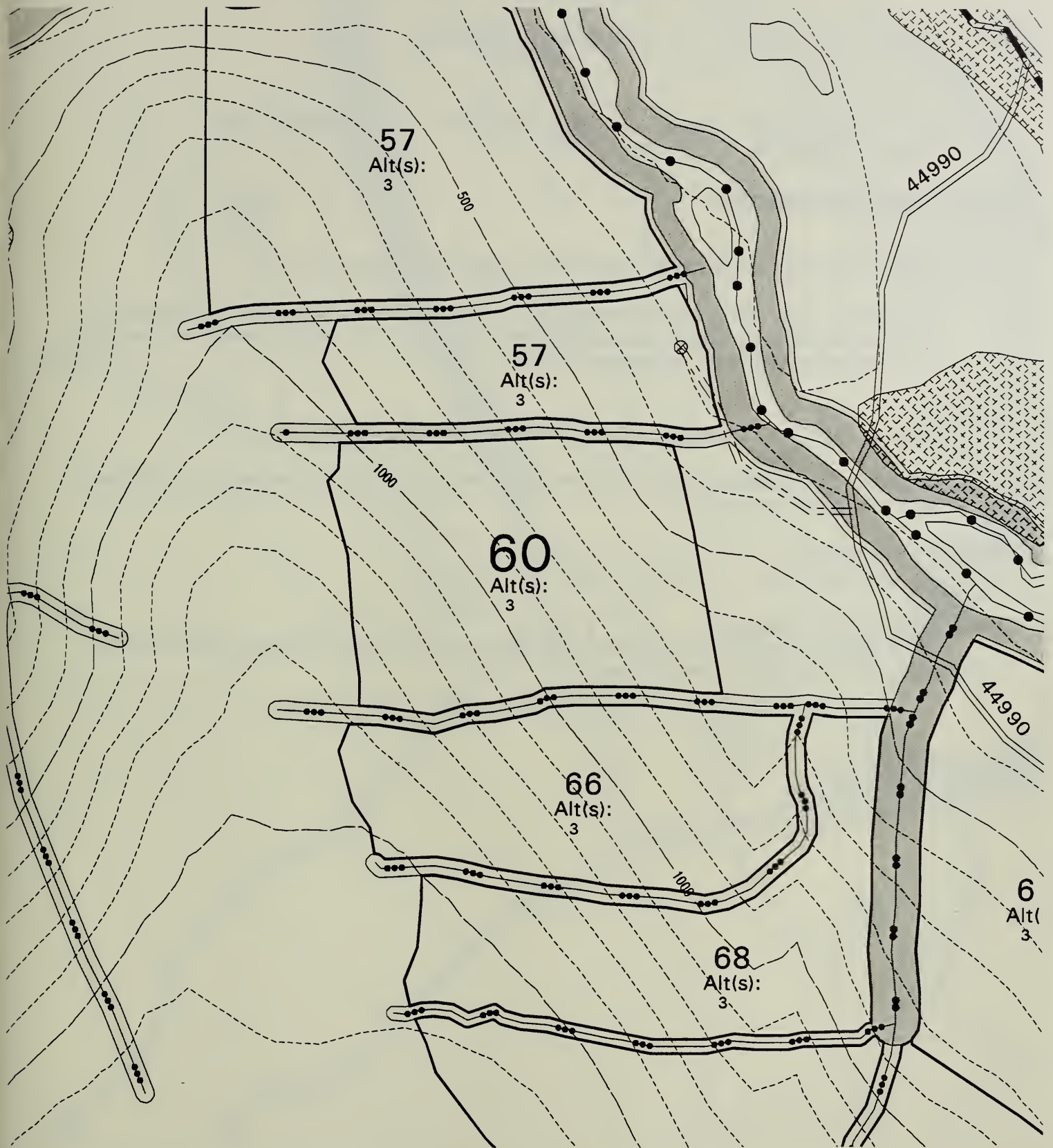
**Silvicultural Prescription**

Group Selection - 30% removal

**Logging System and Unit Design**

Unit is designed to follow slope break above Class III streams on north and south boundaries. Establish unit boundary far enough away from the slope break to prevent soil and wind disturbance. Helicopter logging to Road 44990 is planned.

# Crystal Creek Timber Harvest Unit 60



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |

0 660 1320

Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 61**

Acres: 18      Alternative (s): 3 and 4      MBF Volume: 276      MCF Volume : 76  
1977 Aerial Photo: Flight #: 53      Photo #: 100

**Resource Concerns and Mitigation**

**Fisheries**

Concern: High Gradient Contained, Class II stream channel to the north of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined within 100 feet of the stream or to the top of the V-notch (side-slope break), whichever is greater.

**Hydrology**

Concern: High Gradient Contained, Class III stream channel within the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

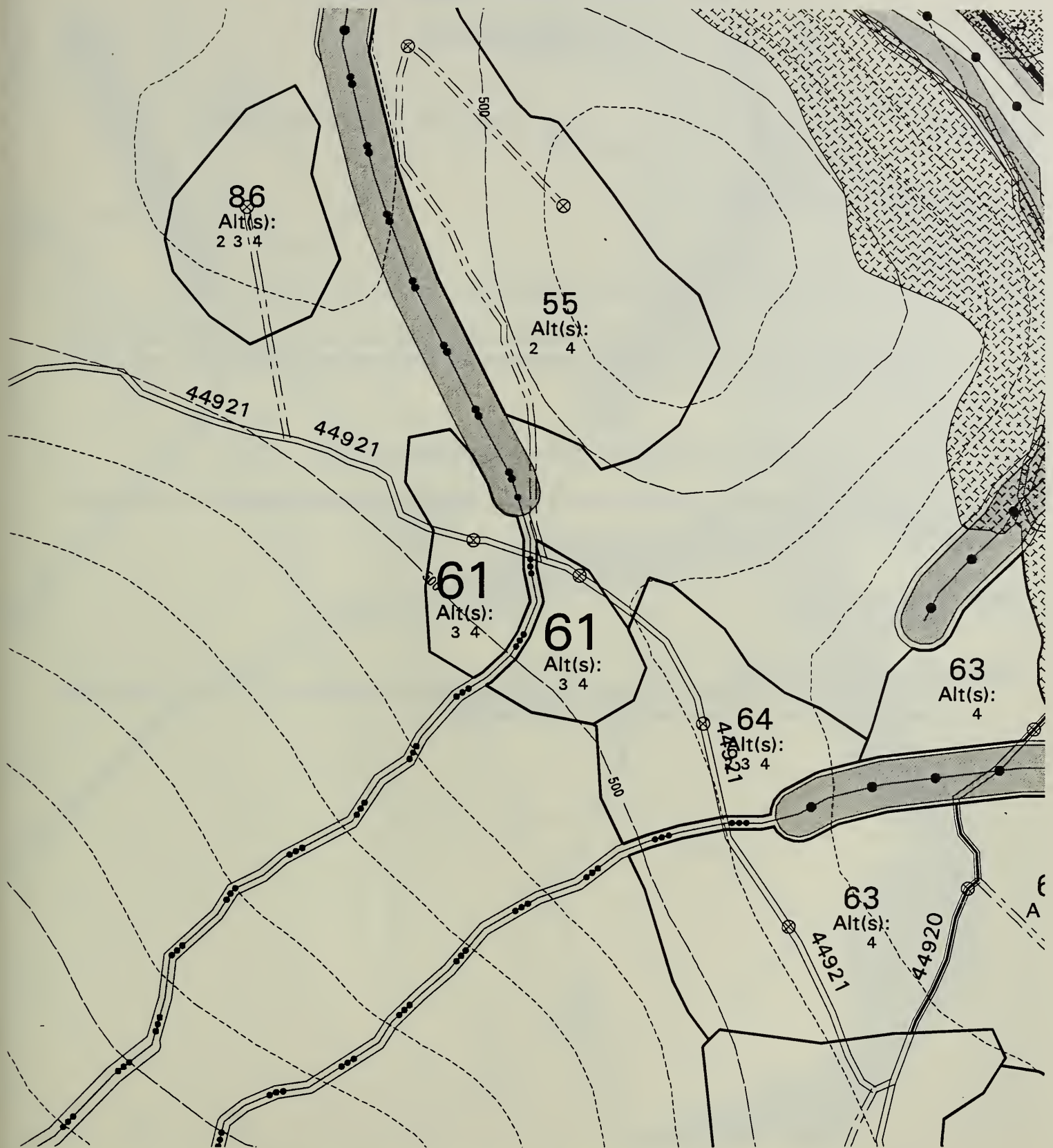
**Silvicultural Prescription**

Clearcut with reserves

**Logging System and Unit Design**

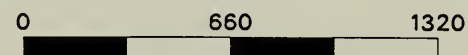
Unit is split by a Class III stream with Road 44920 going through the unit. Maintain adequate windfirm buffer. Unit is planned for shovel yarding.

# Crystal Creek Timber Harvest Unit 61



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- 
- Proposed Unit Boundaries
- Non-NF Lands
- Existing Managed Stands
- TTRA Buffers
- Riparian Management Area
- Lake Buffers
- Waterfowl Buffers
- AHMU-Class 1 Streams
- AHMU-Class 2 Streams
- AHMU-Class 3 Streams
- Lakes and Major Rivers
- Existing Forest Development Roads
- Existing Closed Roads
- Proposed Forest Development Roads
- Proposed Temporary Roads
- Landings
- 500-ft. Contour Interval
- 100-ft. Contour Interval
- 0 660



Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 63**

Acres: 40      Alternative (s): 4  
1977 Aerial Photo: Flight #: 53

MBF Volume: 987  
Photo #: 100

MCF Volume: 238

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control, Class I stream channel to the northwest of the unit.

Mitigation: No commercial timber harvest within 100 feet from the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channel north of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

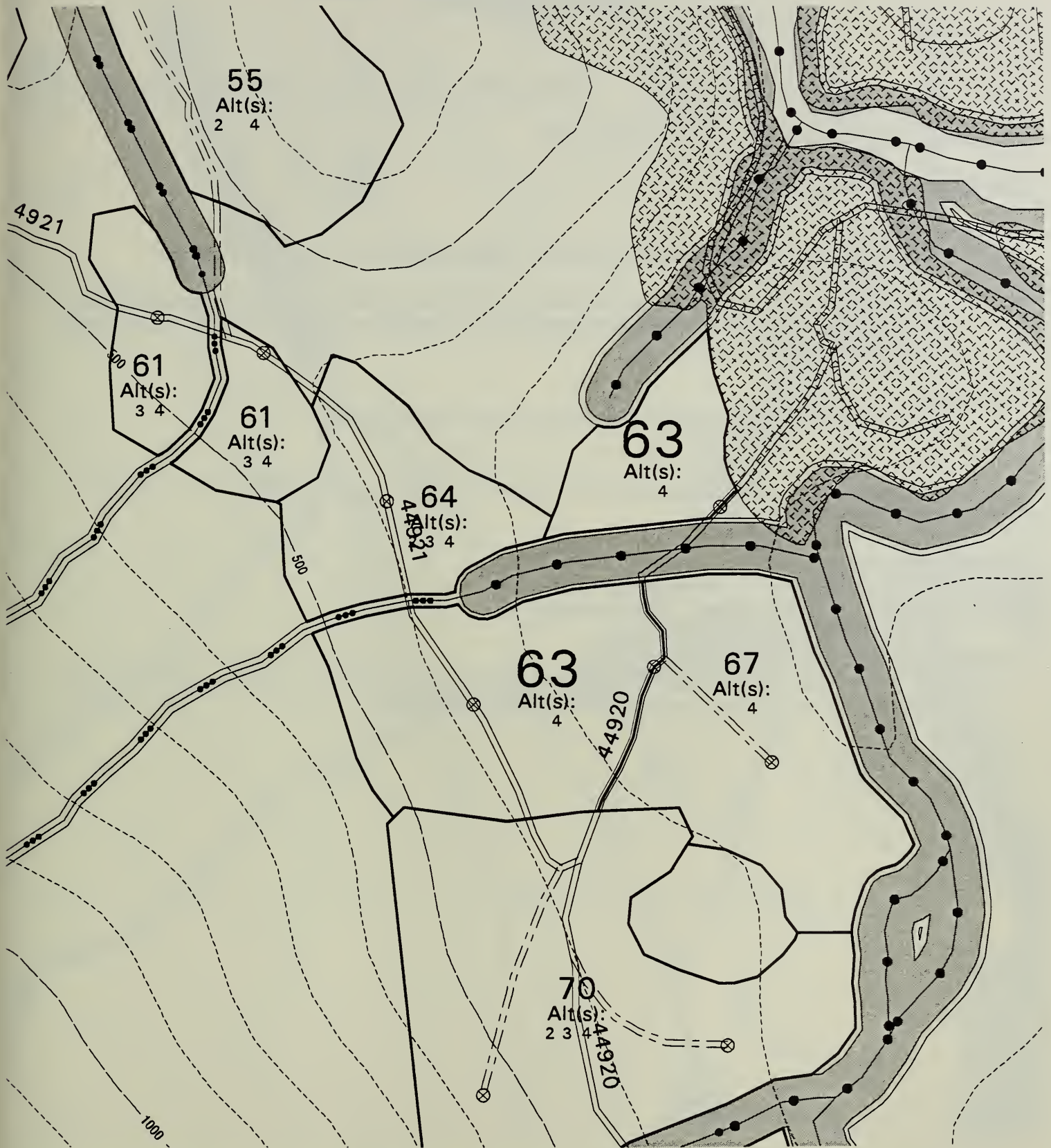
**Silvicultural Prescription**

Clearcut with reserves

**Logging System and Unit Design**

Unit is planned for a combination of shovel and cable logging off of Roads 44920 and 44921. Class I and III streams split the unit. Maintain adequate windfirm buffers.

# Crystal Creek Timber Harvest Unit 63



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 64**

Acres: 19      Alternative (s): 2, 3, and 4      MBF Volume: 428, 428, and 50      MCF Volume : 109, 109, and 13  
1977 Aerial Photo: Flight #: 53      Photo #: 100

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control, Class I stream channel to the southwest of the unit.

Mitigation: No commercial timber harvest within 100 feet from the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channel south the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

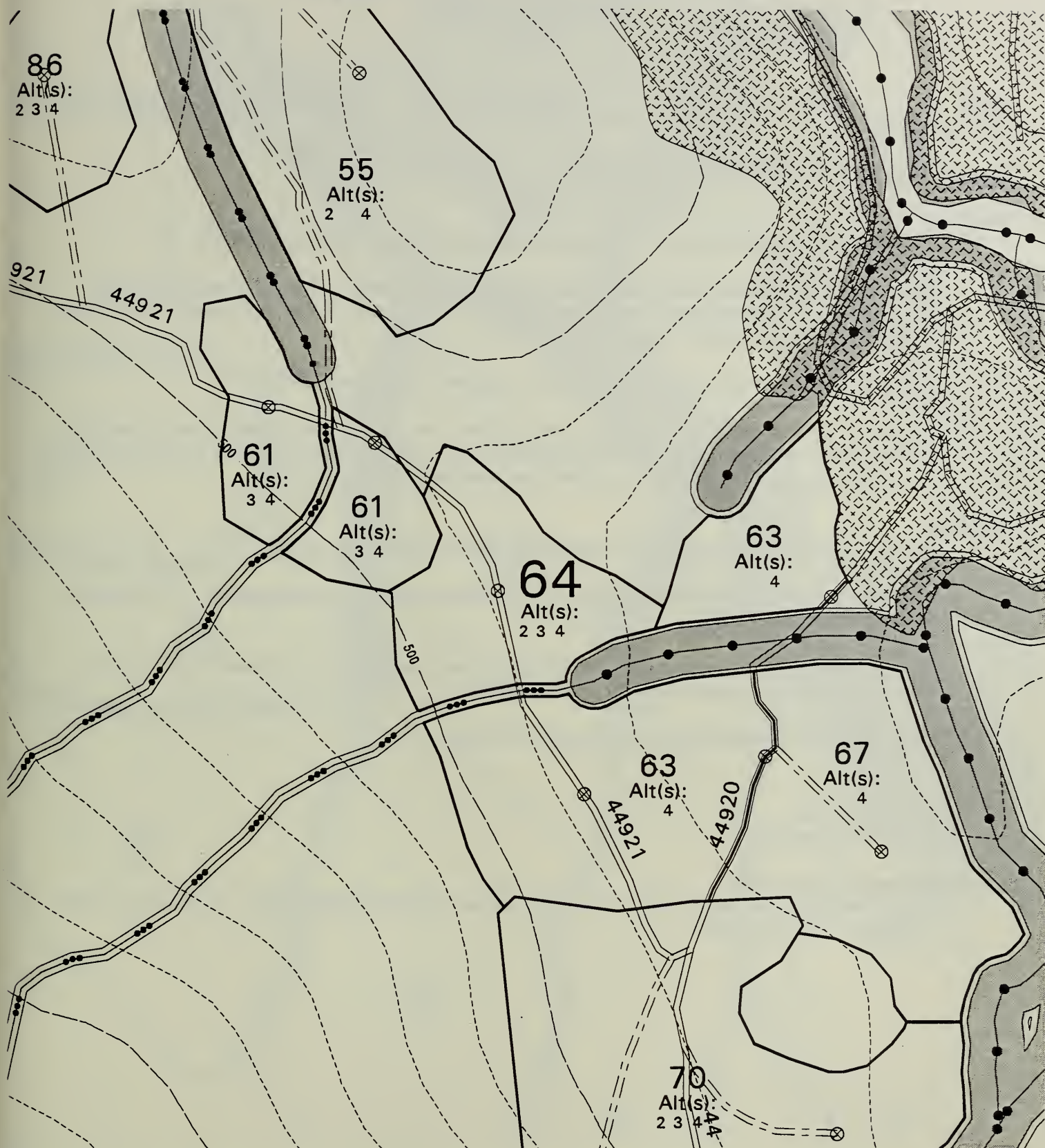
**Silvicultural Prescription**

Clearcut with reserves (Alternative 2 and 3)  
Group Selection - 10% removal (Alternative 4)

**Logging System and Unit Design**

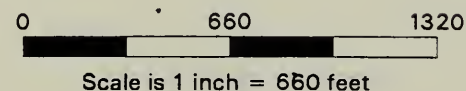
Unit borders Class I and III stream buffers along the south boundary and has a common boundary with Unit 61 to the northwest. Unit is planned for shovel logging to Road 44921.

# Crystal Creek Timber Harvest Unit 64



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |





**Crystal Creek Unit Card**  
**Unit 65**

Acres: 47      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 1134  
Photo #: 174

MCF Volume: 289

**Resource Concerns and Mitigation**

**Fisheries**

Concern: High Gradient Contained Class II stream channels to the east and west of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

Concern: Glacial Outwash, Class I stream channel to the north of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest in the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 130 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channel southwest of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

Concern: A large blowdown patch was located along the west bank. Trees were oriented in a downstream direction. Blowdown of stream adjacent buffers is possible.

Mitigation: Feather buffers along the west boundary of unit.

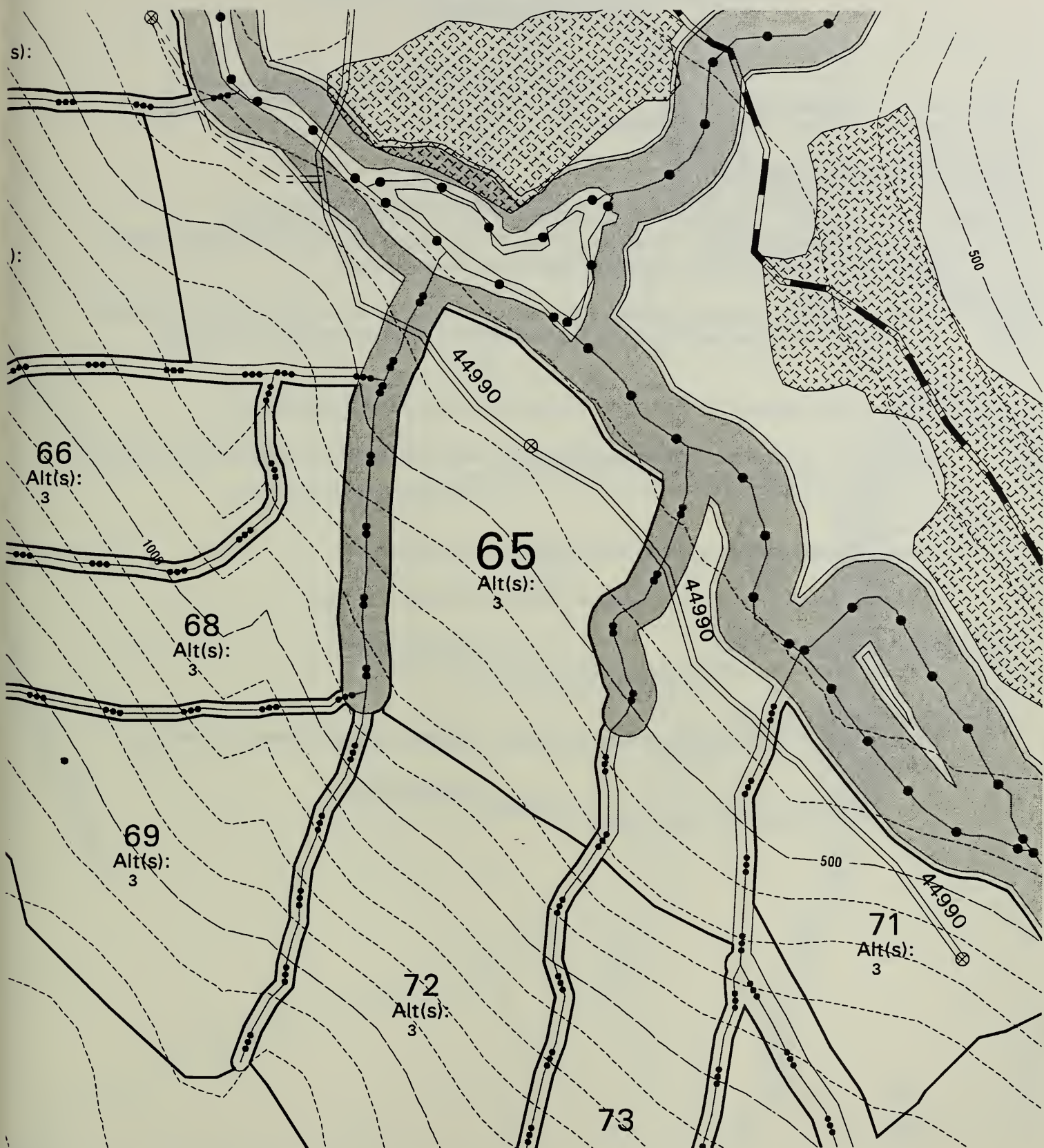
**Silvicultural Prescription**

Clearcut with reserves

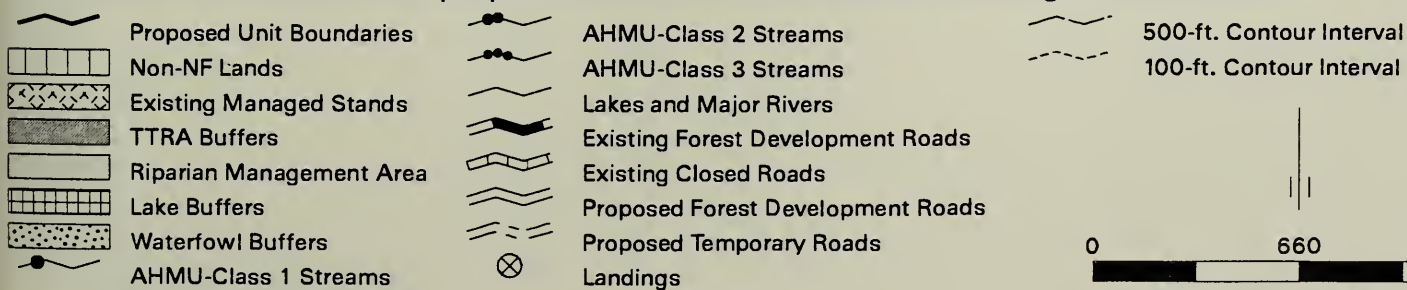
**Logging System and Unit Design**

Unit borders Class I, II, and III stream buffers. Provide for adequate windfirm buffers. Skyline cable system is planned for timber removal.

# Crystal Creek Timber Harvest Unit 65



Alternatives that include the proposed units are listed beneath the larger unit numbers.



0 660 1320

Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 66**

Acres: 34      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 267  
Photo #: 174

MCF Volume : 70

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in the eastern portion of unit.

Mitigation: Retain some trees on unstable terrain to maintain slope stability.

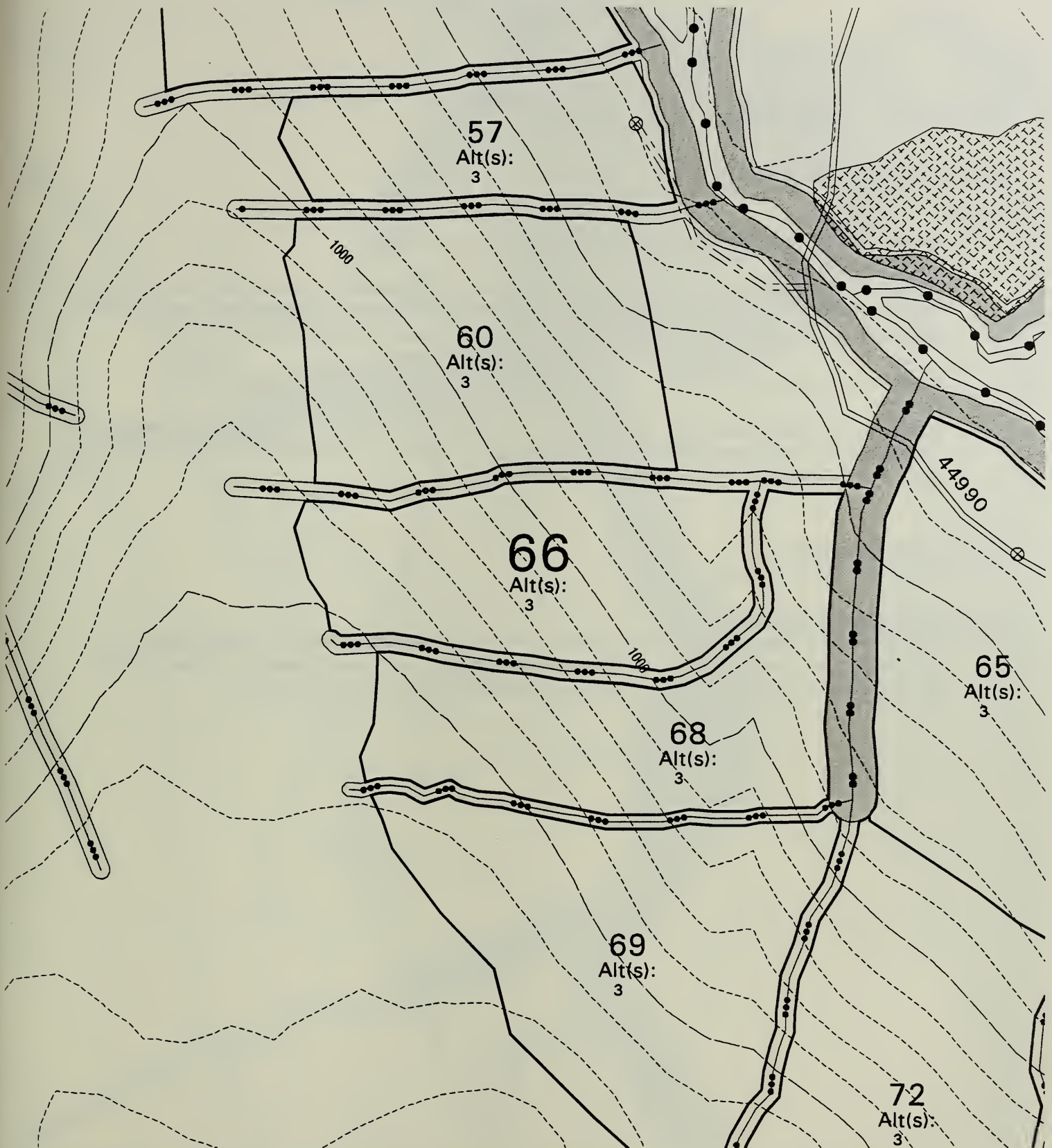
**Silvicultural Prescription**

Group Selection - 30% removal

**Logging System and Unit Design**

Maintain windfirm boundaries along Class III streams. Helicopter logging is planned with yarding to a landing in Unit 65.

# Crystal Creek Timber Harvest Unit 66



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**

**Unit 67**

Acres: 30      Alternative (s): 4  
1977 Aerial Photo: Flight #: 53

MBF Volume: 261  
Photo #: 100

MCF Volume : 67

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Flood Plain, Class I stream channel to the west of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest in the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 130 feet).

Concern: Moderate Gradient/Mixed Control, Class I stream channel to the northwest of the unit.

Mitigation: No commercial timber harvest within 100 feet from the channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 120 feet).

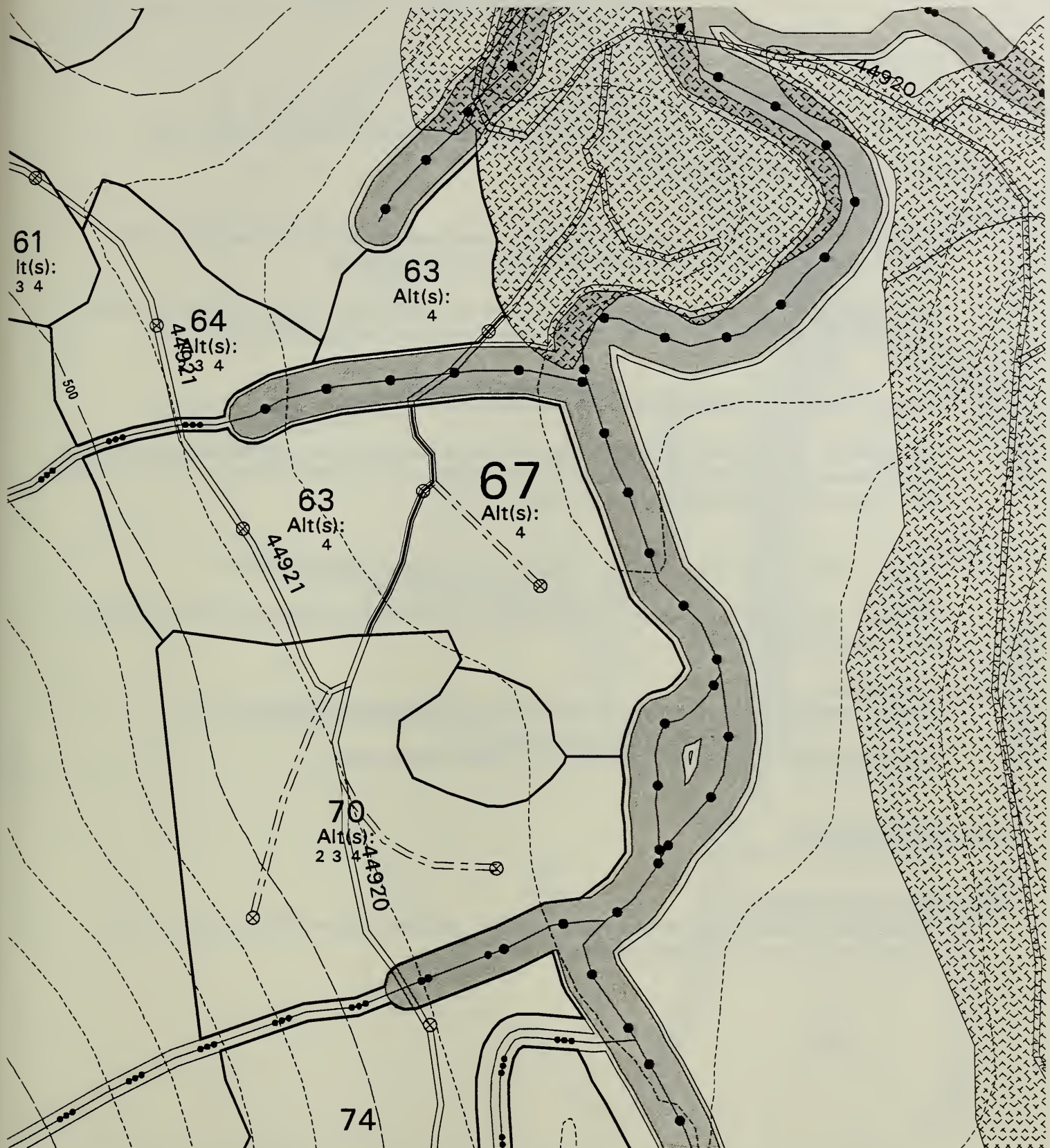
**Silvicultural Prescription**

Group Selection - 30% removal

**Logging System and Unit Design**

Unit boundary is planned to follow Class I stream on the north and east boundaries; maintain adequate windfirm buffers. Following Road 44920 along west boundary. South central boundary borders a muskeg. Short temporary road reduces shovel yarding distance which minimizes soil disturbance.

# Crystal Creek Timber Harvest Unit 67



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |



**Crystal Creek Unit Card**  
**Unit 68**

Acres: 35      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 284  
Photo #: 174

MCF Volume: 75

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Fisheries**

Concern: High Gradient Contained Class II stream channels to the east of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

**Hydrology**

Concern: High Gradient Contained, Class III stream channel north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in portions of the eastern two thirds of the unit.

Mitigation: Retain some trees on unstable terrain to maintain slope stability.

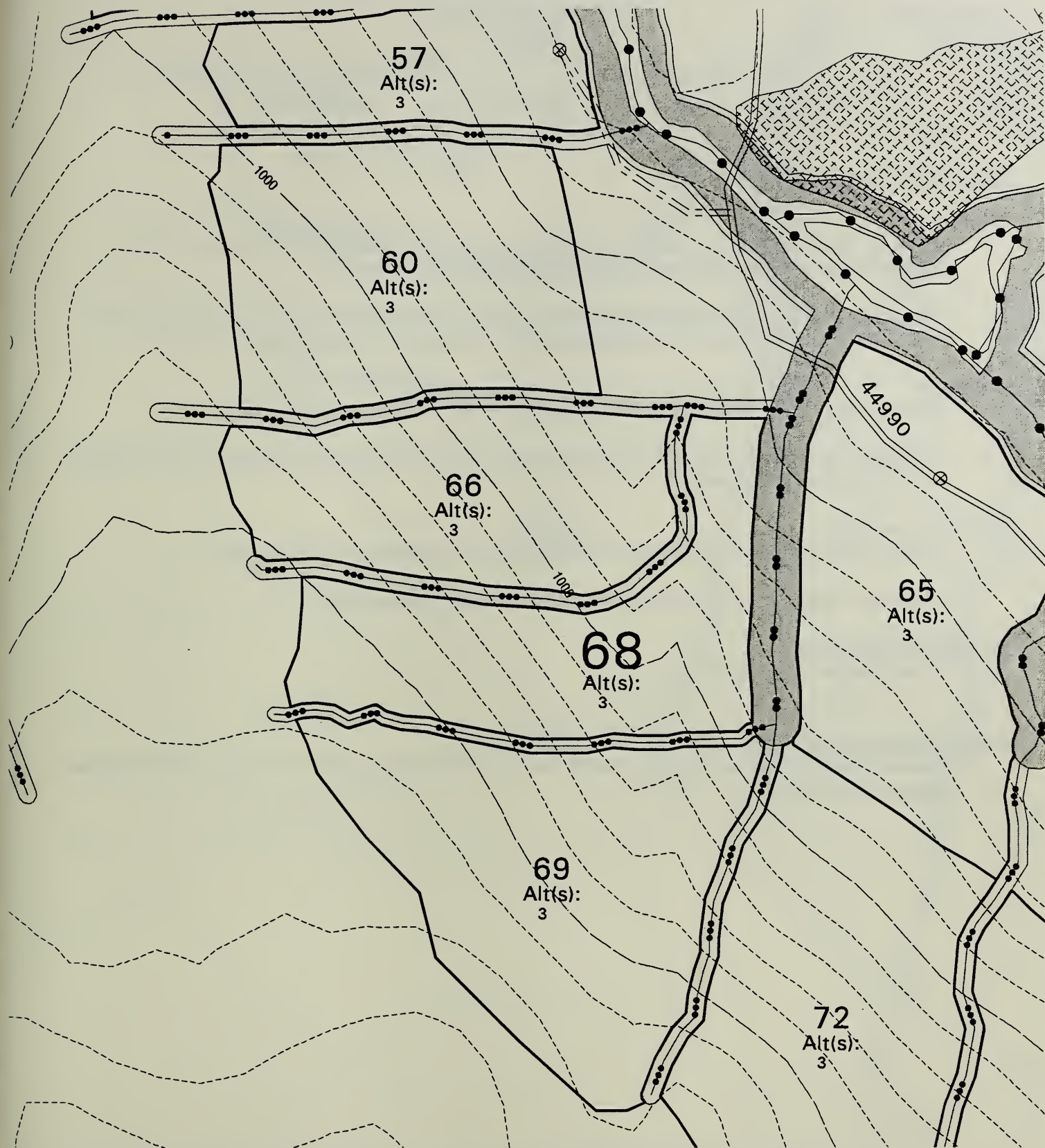
**Silvicultural Prescription**

Group Selection - 30% removal

**Logging System and Unit Design**

Follow Class II and III stream buffers for unit boundaries. Maintain adequate windfirm buffers. Unit is planned for helicopter logging using landings in Unit 65.

# Crystal Creek Timber Harvest Unit 68



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 69**

Acres: 49      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 374  
Photo #: 174

MCF Volume : 99

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channel north and west of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in portions of the eastern two-thirds of unit.

Mitigation: Retain some trees on unstable terrain to maintain slope stability.

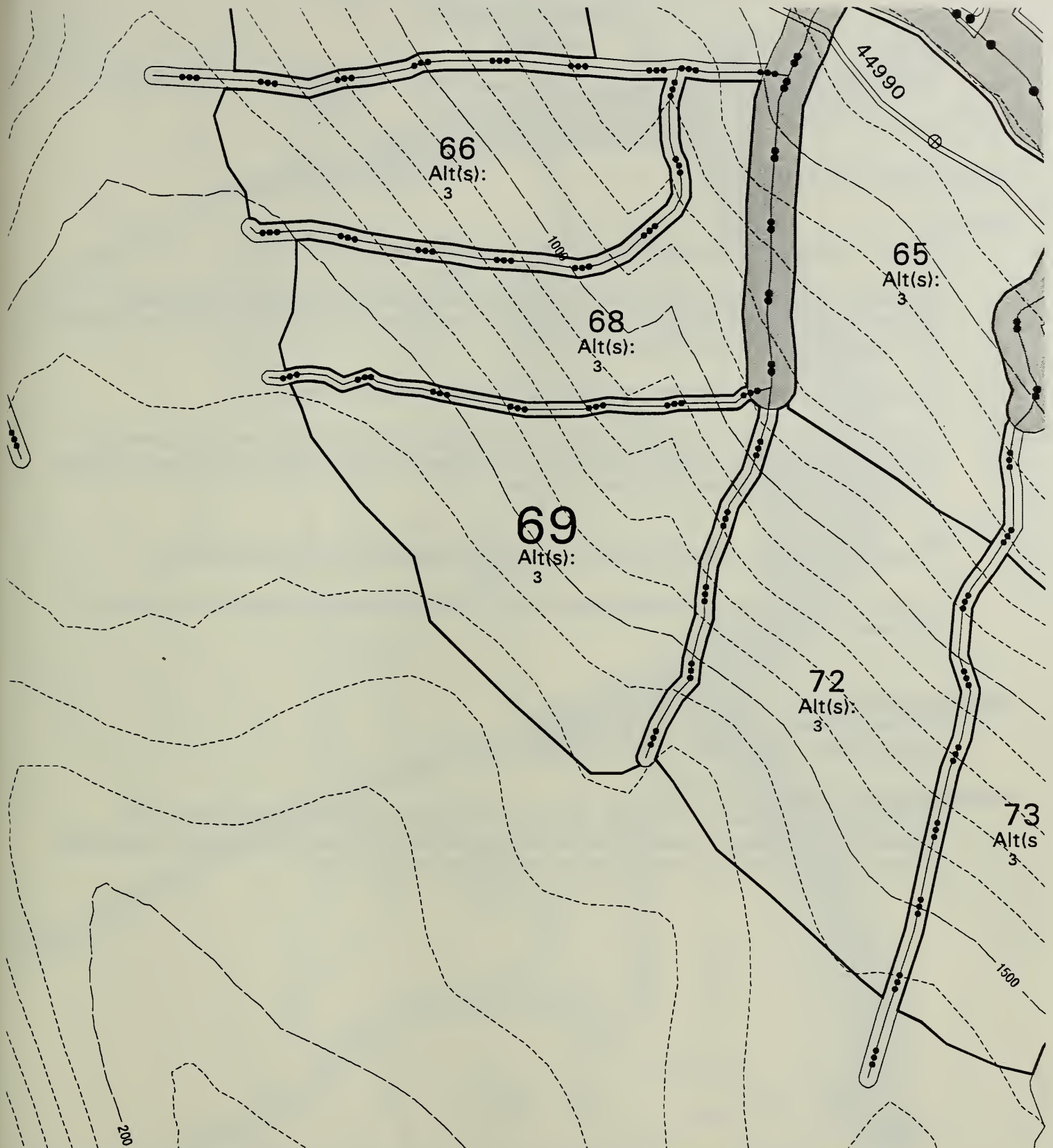
**Silvicultural Prescription**

Group Selection - 30% removal

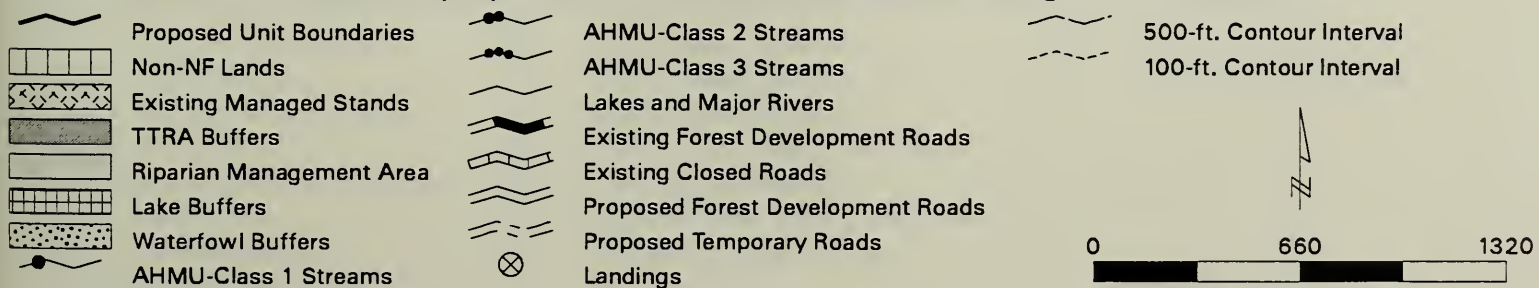
**Logging System and Unit Design**

Maintain windfirm boundaries along Class III streams to the north and south. Unit is planned for helicopter logging utilizing landings in Unit 65.

# Crystal Creek Timber Harvest Unit 69



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 70**

Acres: 57      Alternative (s): 2, 3, and 4      MBF Volume: 1405, 1405, and 165      MCF Volume :357,  
357, 42  
1977 Aerial Photo: Flight #: 53      Photo #: 101

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control, Class I stream channel east of the unit.

Mitigation: No commercial timber harvest within 100 feet of Class I stream channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soil, riparian associated wetland fens, or 120 feet).

Concern: High Gradient Contained Class II stream channels to the south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Silvicultural Prescription**

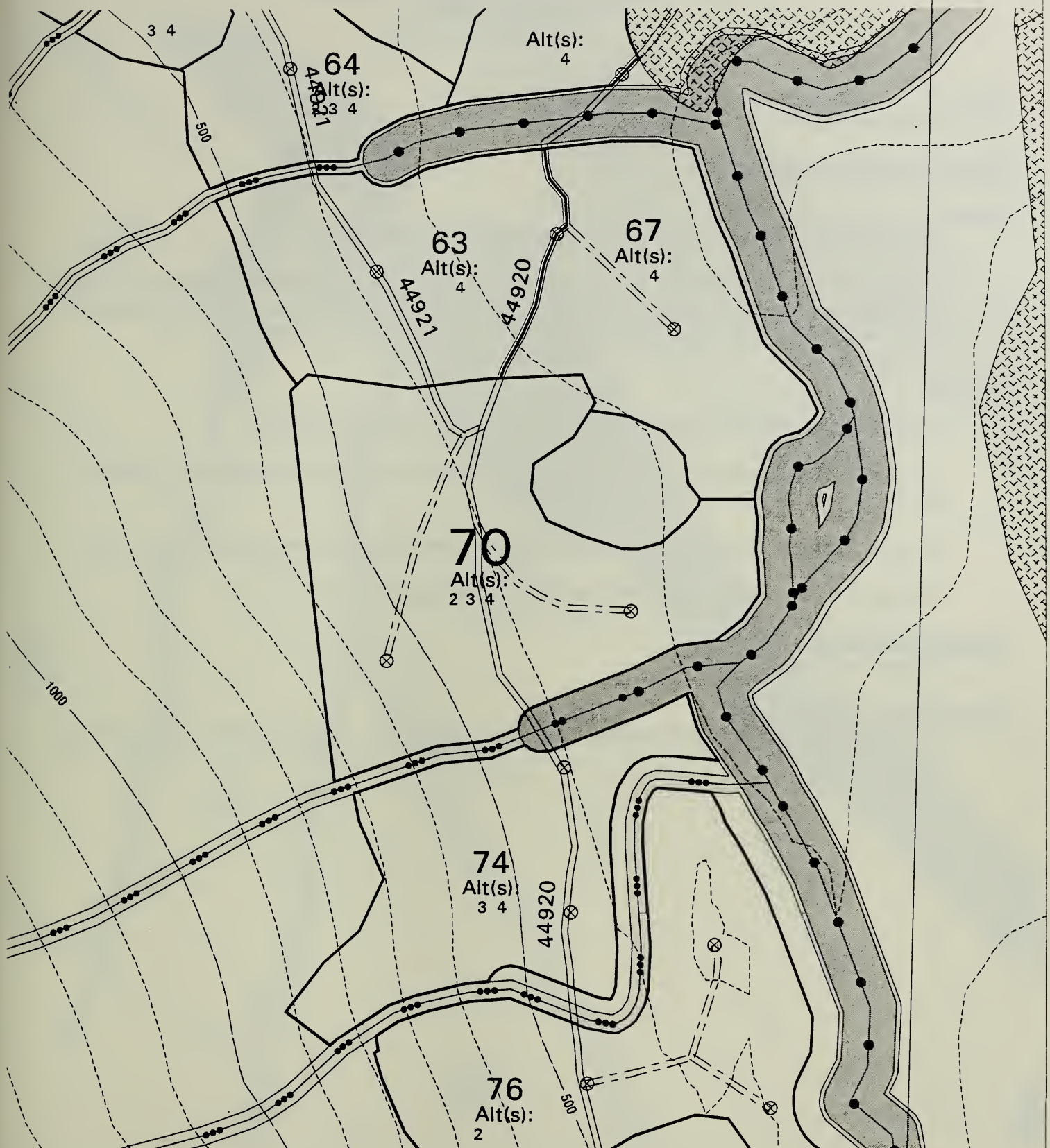
Clearcut with reserves (Alternative 2 and 3)

Group Selection - 10% removal (Alternative 4)

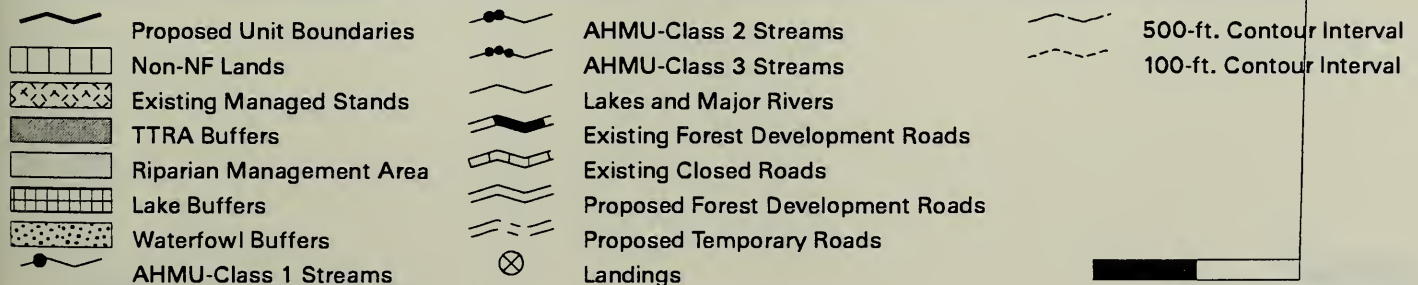
**Logging System and Unit Design**

South boundary is planned to follow Class II and III streams; provide adequate windfirm buffers. The northeast corner borders on a muskeg. The west boundary follows logical yarding boundaries. Combination of shovel logging below Road 44920 and cable yarding above road is planned.

# Crystal Creek Timber Harvest Unit 70



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 71**

Acres: 31      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 764  
Photo #: 173

MCF Volume: 195

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Glacial Outwash, Class I stream channel to the northeast of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No commercial timber harvest in the flood plain. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soils, riparian associated wetland fens, or 130 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the west of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

Concern: Strong down stream winds suspected since unit is second growth created by previous blowdown.

Mitigation: Feather buffer along the west boundary of Class III stream.

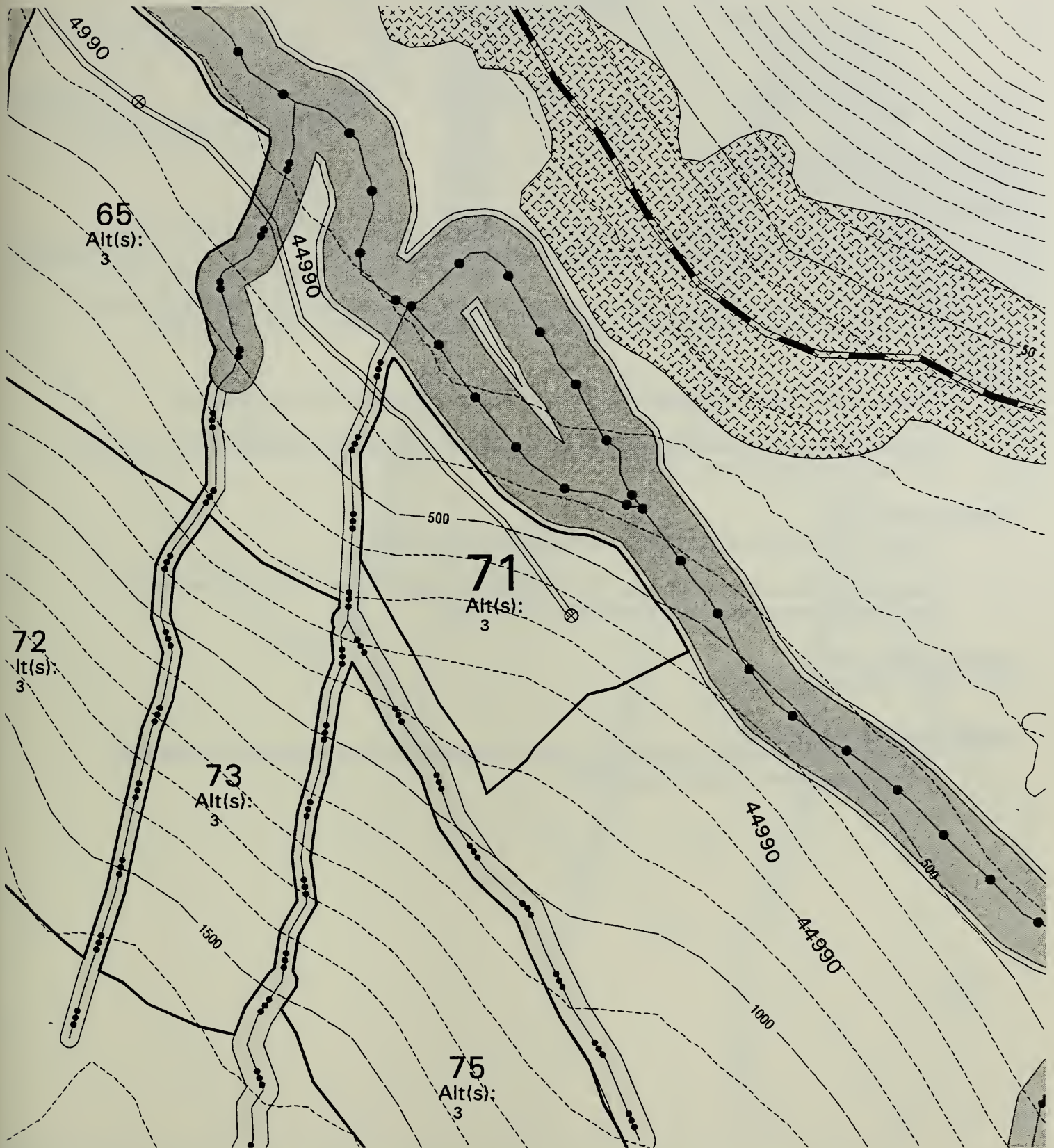
**Silvicultural Prescription**

Clearcut with reserves

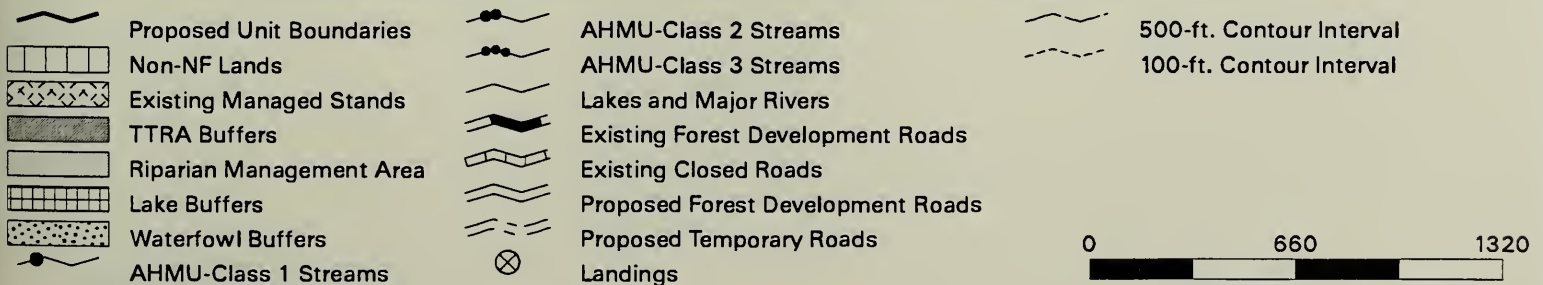
**Logging System and Unit Design**

Unit boundaries are planned to follow Class I and III stream buffers providing for adequate windfirm buffers. Cable logging is planned.

# Crystal Creek Timber Harvest Unit 71



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 72**

Acres: 55      Alternative (s): 3

MBF Volume: 454

MCF Volume: 118

1977 Aerial Photo: Flight #: 55

Photo #: 173

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the west and east of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in central portion of unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability. Work with the soil scientist during implementation to identify isolated areas of steep slope.

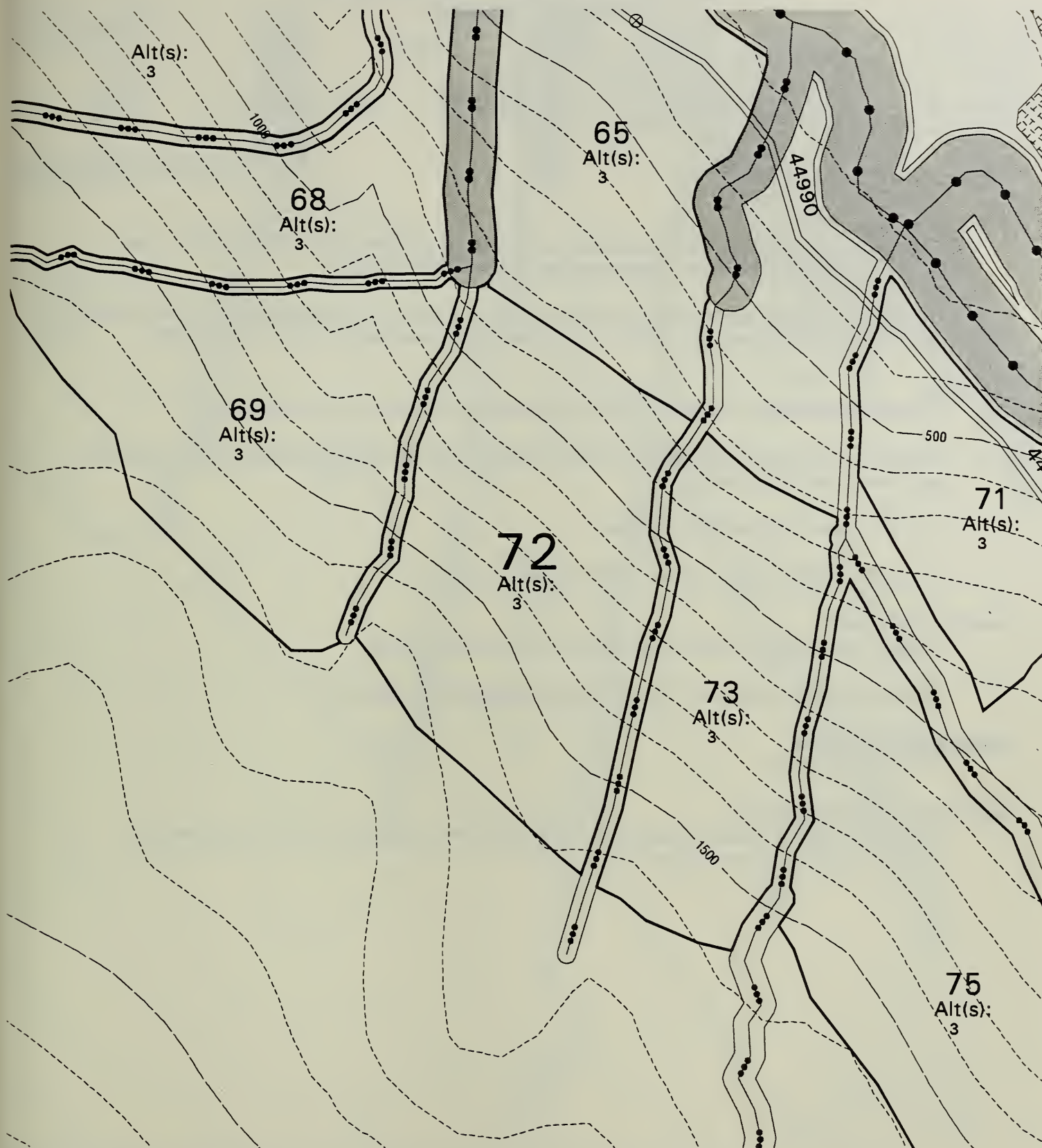
**Silvicultural Prescription**

Group Selection - 30% removal

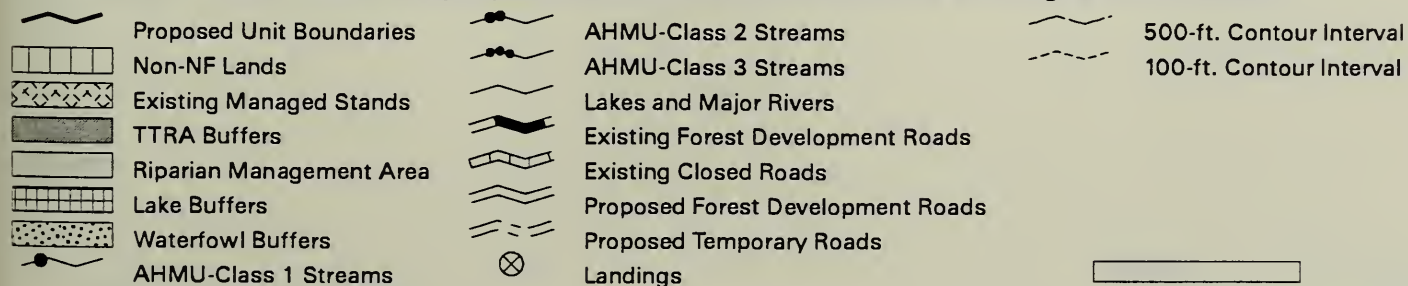
**Logging System and Unit Design**

Provide for adequate windfirm buffers along Class III streams to the east and west. Unit is planned for helicopter logging utilizing landings in Unit 65.

# Crystal Creek Timber Harvest Unit 72



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 73**

Acres: 35      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 833  
Photo #: 173

MCF Volume : 217

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the west and east of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

Concern: Observed blowdown in the area.

Mitigation: Feather class III stream buffer along west boundary.

**Landslide Prone Soils**

Concern: Isolated areas of steep slope located in central portion of unit.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

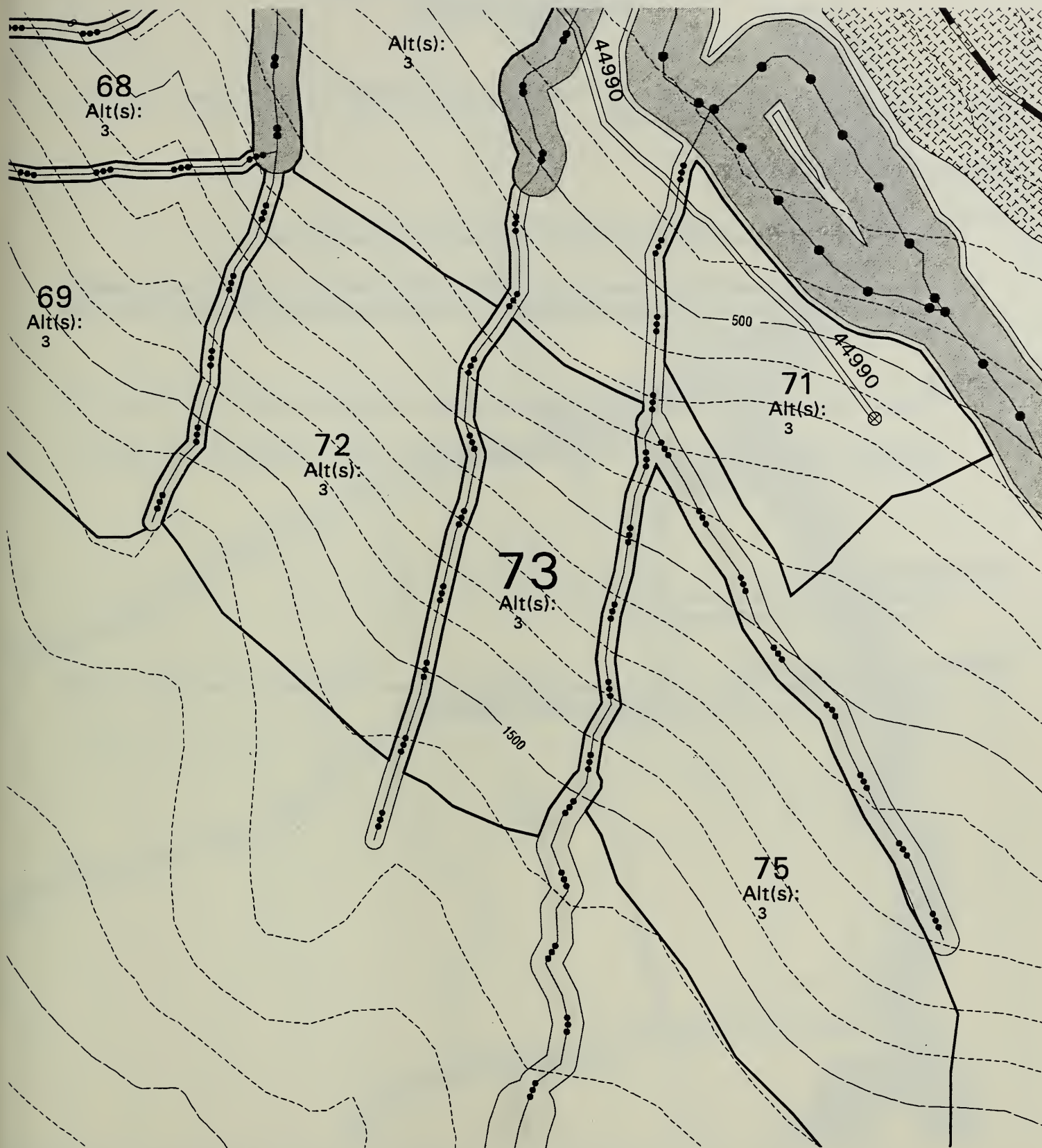
**Silvicultural Prescription**

Clearcut with reserves

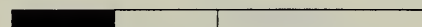
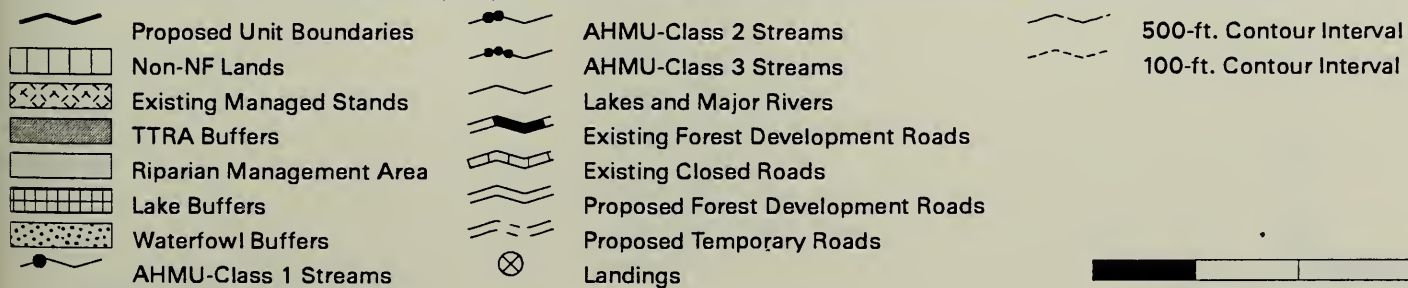
**Logging System and Unit Design**

Provide for adequate windfirm buffers along Class III streams to the east and west. Unit is planned for helicopter logging utilizing landings in Unit 65.

# Crystal Creek Timber Harvest Unit 73



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 74**

Acres: 32      Alternative (s): 3 and 4      MBF Volume: 240 and 680      MCF Volume : 65 and 201  
1977 Aerial Photo: Flight #: 53      Photo #: 101

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control, Class I stream channel east of the unit.

Mitigation: No commercial timber harvest within 100 feet of Class I channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soil, riparian associated wetland fens, or 120 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and to the south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Silvicultural Prescription**

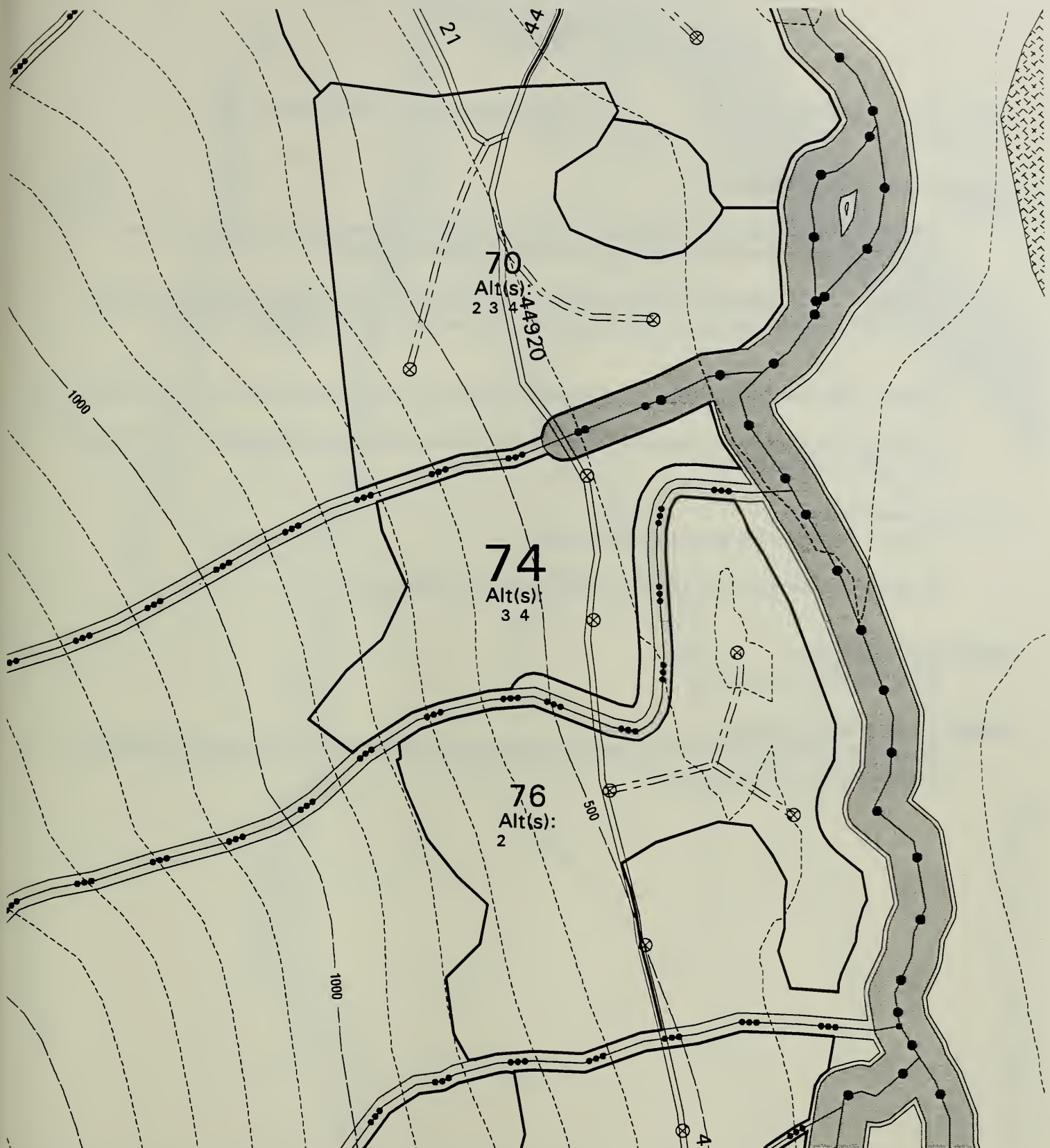
Group Selection - 30% removal (Alternative 3)

Clearcut with reserves (Alternative 4)

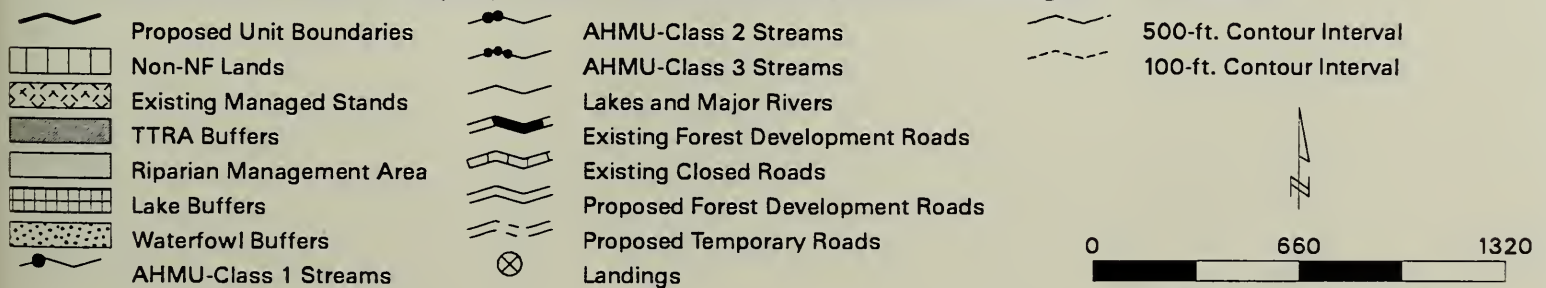
**Logging System and Unit Design**

Unit boundary follows Class I and II streams; provide for adequate wind firm buffers. Combination of shovel logging below road and cable logging above road is planned.

# Crystal Creek Timber Harvest Unit 74



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Scale is 1 inch = 660 feet



**Crystal Creek Unit Card**  
**Unit 75**

Acres: 65      Alternative (s): 3  
1977 Aerial Photo: Flight #: 55

MBF Volume: 566  
Photo #: 172

MCF Volume : 144

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat kidding area to west of unit on steep mountainside on east side of Crystal Creek. Goat summer range in high-elevation muskeg/subalpine habitat southwest of unit.

Mitigation: Avoid helicopter overflights on the east side of Crystal Creek and on the ridgetop west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the northeast and north west of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Portions of the unit contain steep slopes.

Mitigation: Retain some trees on steeper slopes to maintain slope stability.

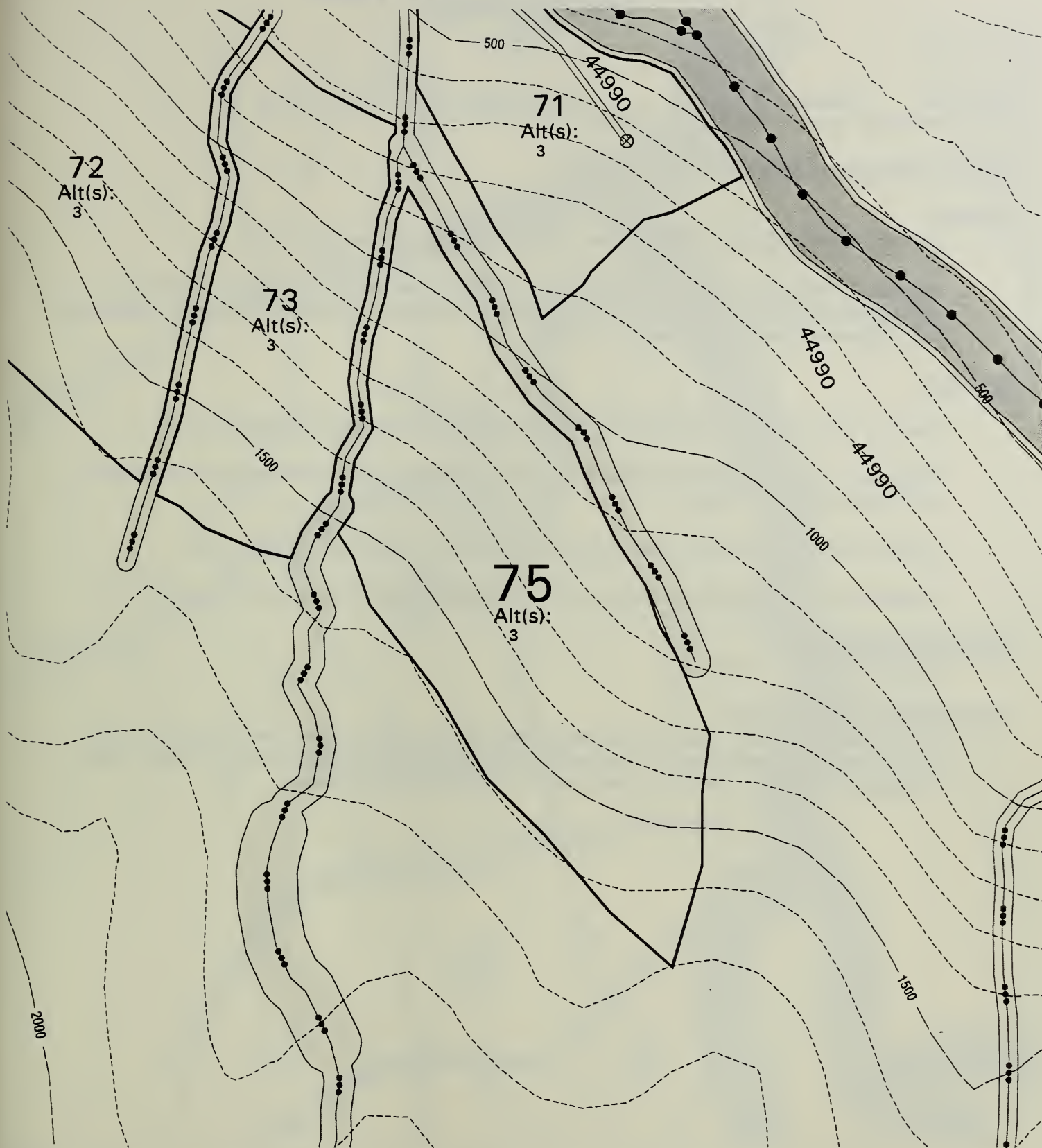
**Silvicultural Prescription**

Group Selection - 30% removal

**Logging System and Unit Design**

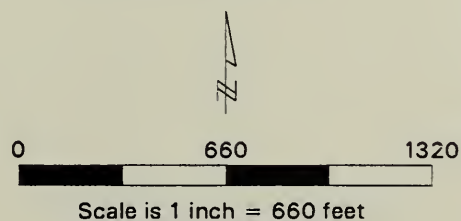
Maintain windfirm boundaries along Class III streams to the north and west. Unit is planned for helicopter logging utilizing landings in unit 65.

# Crystal Creek Timber Harvest Unit 75



Alternatives that include the proposed units are listed beneath the larger unit numbers.

- |  |                          |  |                                   |  |                          |
|--|--------------------------|--|-----------------------------------|--|--------------------------|
|  | Proposed Unit Boundaries |  | AHMU-Class 2 Streams              |  | 500-ft. Contour Interval |
|  | Non-NF Lands             |  | AHMU-Class 3 Streams              |  | 100-ft. Contour Interval |
|  | Existing Managed Stands  |  | Lakes and Major Rivers            |  |                          |
|  | TTRA Buffers             |  | Existing Forest Development Roads |  |                          |
|  | Riparian Management Area |  | Existing Closed Roads             |  |                          |
|  | Lake Buffers             |  | Proposed Forest Development Roads |  |                          |
|  | Waterfowl Buffers        |  | Proposed Temporary Roads          |  |                          |
|  | AHMU-Class 1 Streams     |  | Landings                          |  |                          |





**Crystal Creek Unit Card**  
**Unit 76**

Acres: 60      Alternative (s): 2      MBF Volume: 306      MCF Volume: 86  
1977 Aerial Photo: Flight #: 53      Photo #: 101/102

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/ Mixed Control, Class I stream channel east of the unit.

Mitigation: No commercial timber harvest within 100 feet of Class I stream channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soil, riparian associated wetland fens, or 120 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

Concern: Numerous ephemeral Class IV streams flowing into Crystal Creek throughout unit.

Mitigation: Partial suspend logs over streams to minimize sedimentation and maintain channel stability.

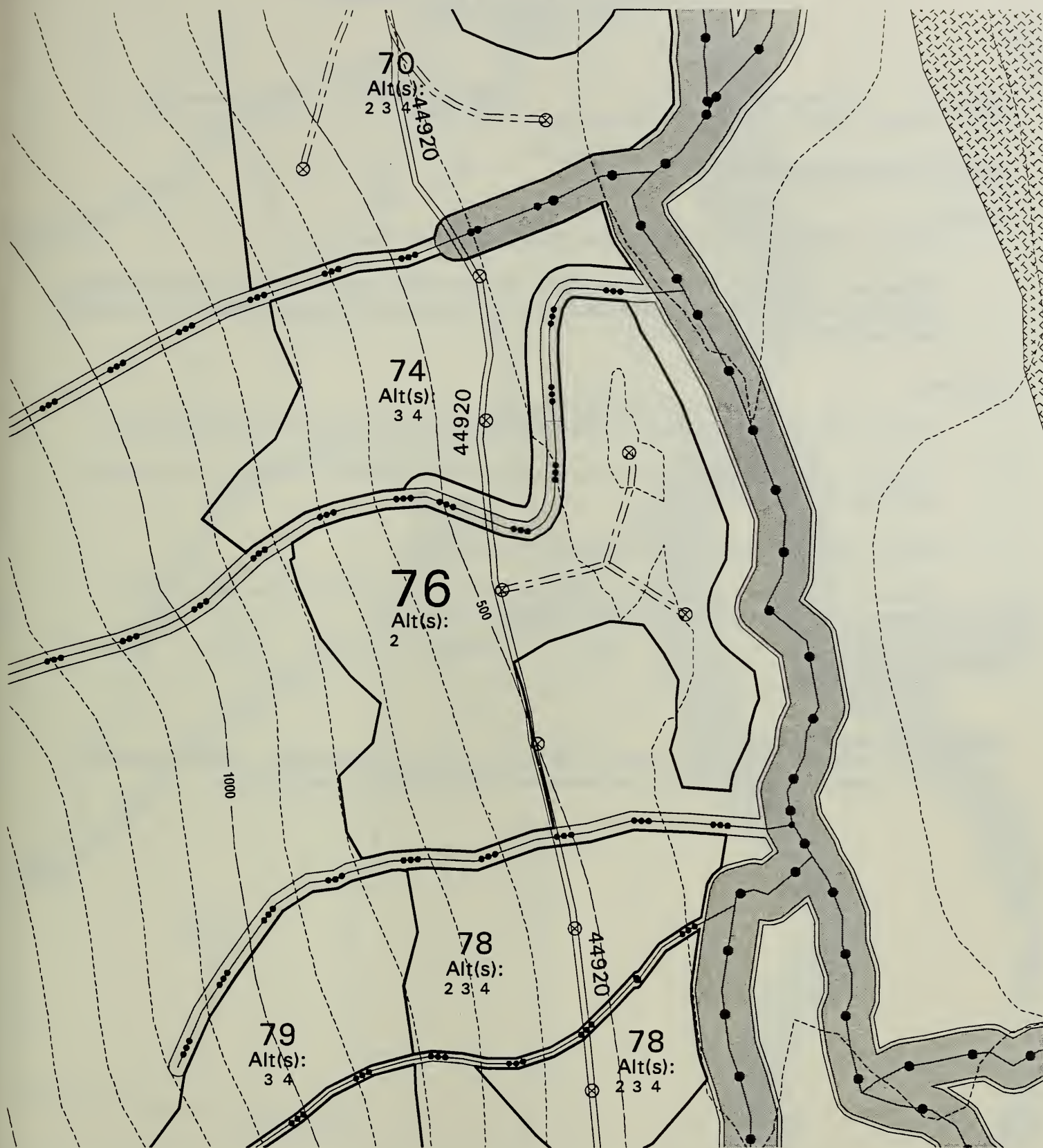
**Silvicultural Prescription**

Group Selection - 30% removal

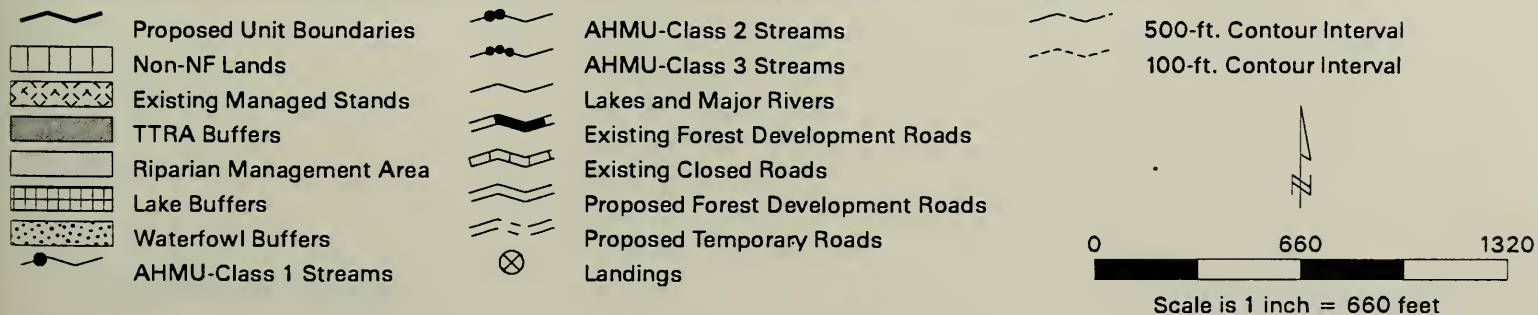
**Logging System and Unit Design**

Unit is designed to follow Class I and III stream buffers on north and east sides following muskeg and low volume timber in southeast corner. Combination of cable logging above specified road is planned. Shovel logging from temporary roads on east side of unit will minimize soil disturbance.

# Crystal Creek Timber Harvest Unit 76



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 78**

Acres: 36      Alternative (s): 2, 3, and 4  
1977 Aerial Photo: Flight #: 53      Photo #: 102

MBF Volume: 684

MCF Volume : 191

**Resource Concerns and Mitigation**

**Fisheries**

Concern: Moderate Gradient/Mixed Control, Class I channel east of the unit.

Mitigation: No commercial timber harvest within 100 feet of Class I channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soil, riparian associated wetland fens, or 120 feet).

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and in the middle of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

Concern: Blowdown patterns indicate moderate risk for blowdown.

Mitigation: Feather both sides of the Class III stream buffer located in the center and along north unit boundary. Feathering should be conducted on both sides of this stream.

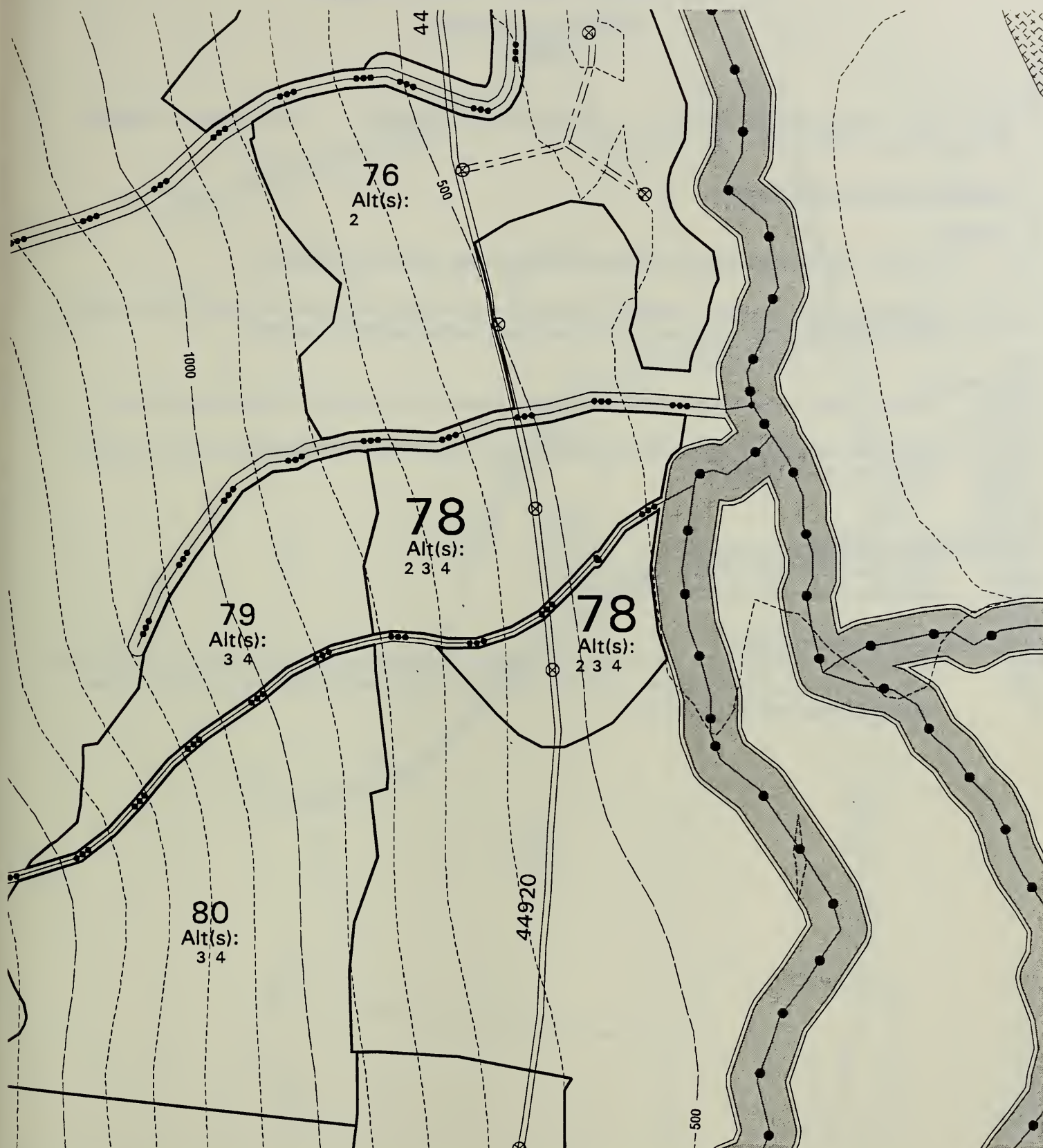
**Silvicultural Prescription**

Clearcut with reserves

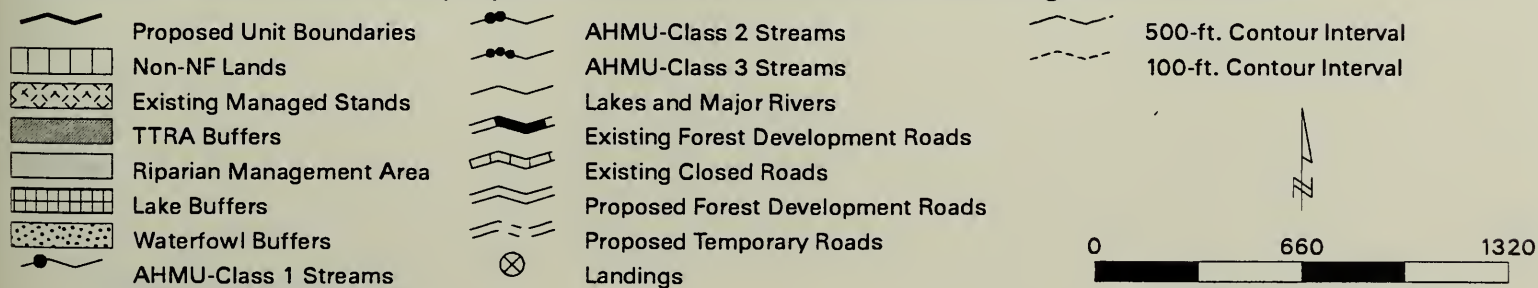
**Logging System and Unit Design**

Unit is designed to follow Class I and III stream buffers on north and east boundary. Class III stream splits unit. Combination of shovel logging below road and cable logging above road is planned.

# Crystal Creek Timber Harvest Unit 78



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 79**

Acres: 24      Alternative (s): 3 and 4      MBF Volume: 173 and 58      MCF Volume : 48 and 16  
1977 Aerial Photo: Flight #: 53      Photo #: 102

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit.

Mitigation: Avoid helicopter overflights of the area above 1500 foot elevation to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and in the middle of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Silvicultural Prescription**

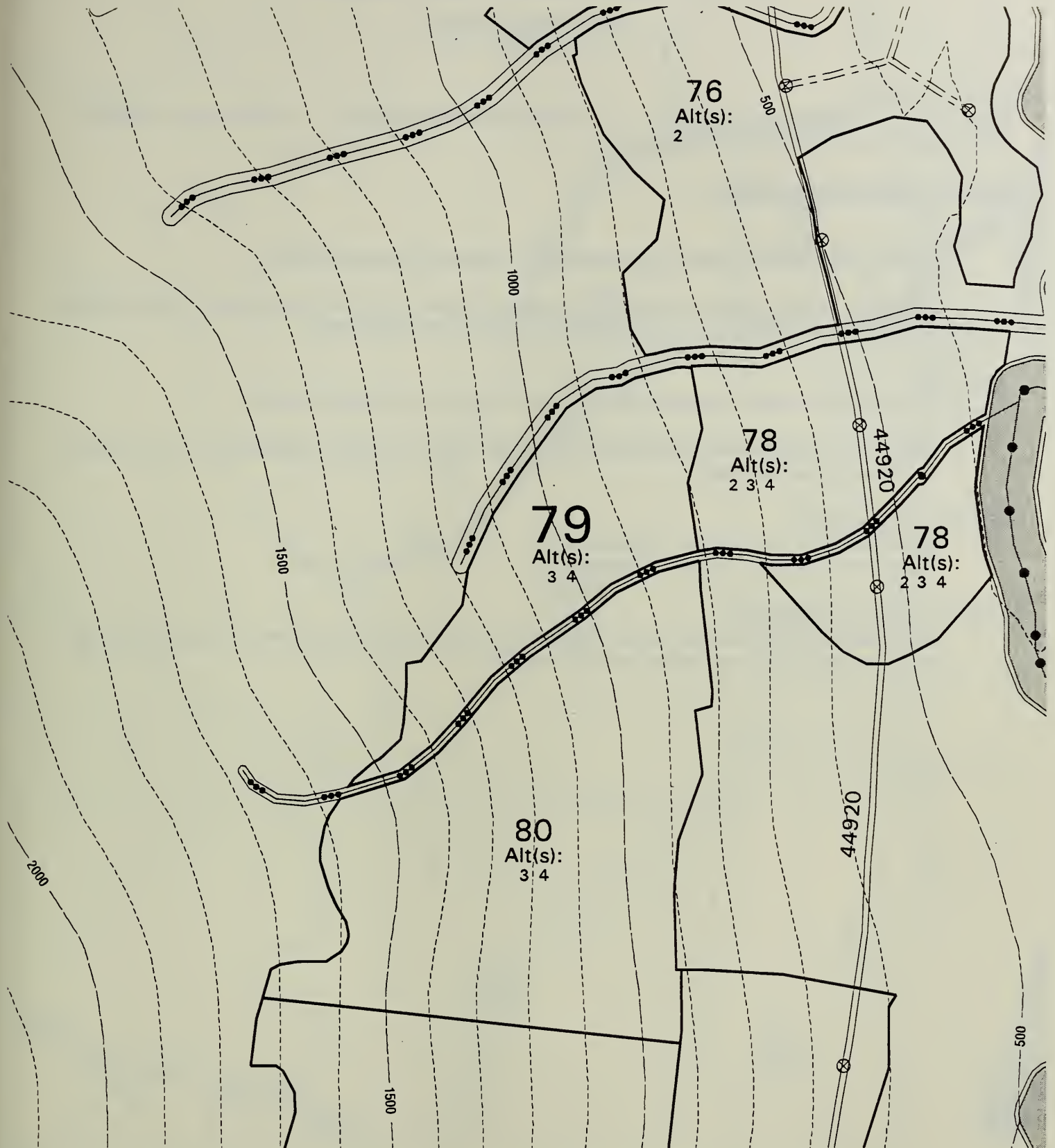
Group Selection - 30% removal (Alternative 3)

Group Selection - 10% removal (Alternative 4)

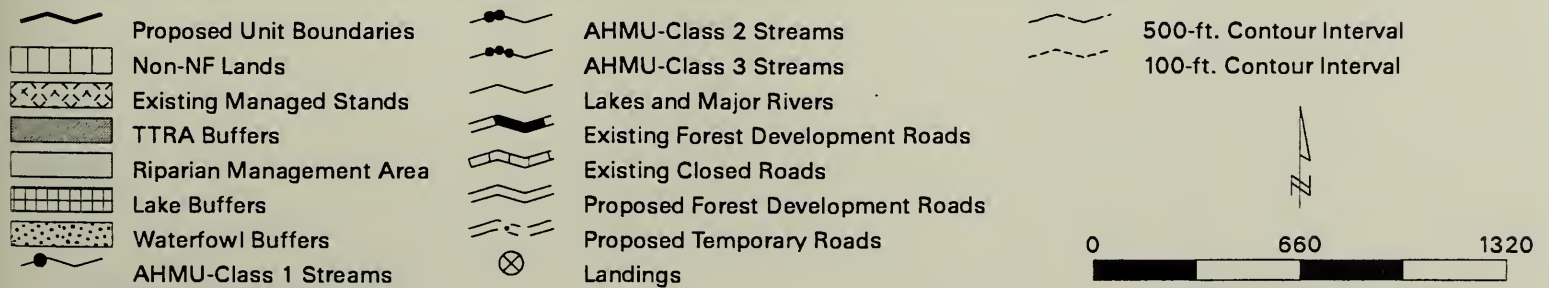
**Logging System and Unit Design**

Unit boundary is designed to follow Class III stream buffers along north and south boundaries. Avoid forested wetland soils along southwest corner. Allow for adequate windfirm buffers. Unit is planned for helicopter logging utilizing landings in Unit 78.

# Crystal Creek Timber Harvest Unit 79



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 80**

Acres: 61      Alternative (s): 3 and 4      MBF Volume: 512 and 171      MCF Volume: 134 and 45  
1977 Aerial Photo: Flight #: 53      Photo #: 102

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit.

Mitigation: Avoid helicopter overflights of the alpine/subalpine area to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Silvicultural Prescription**

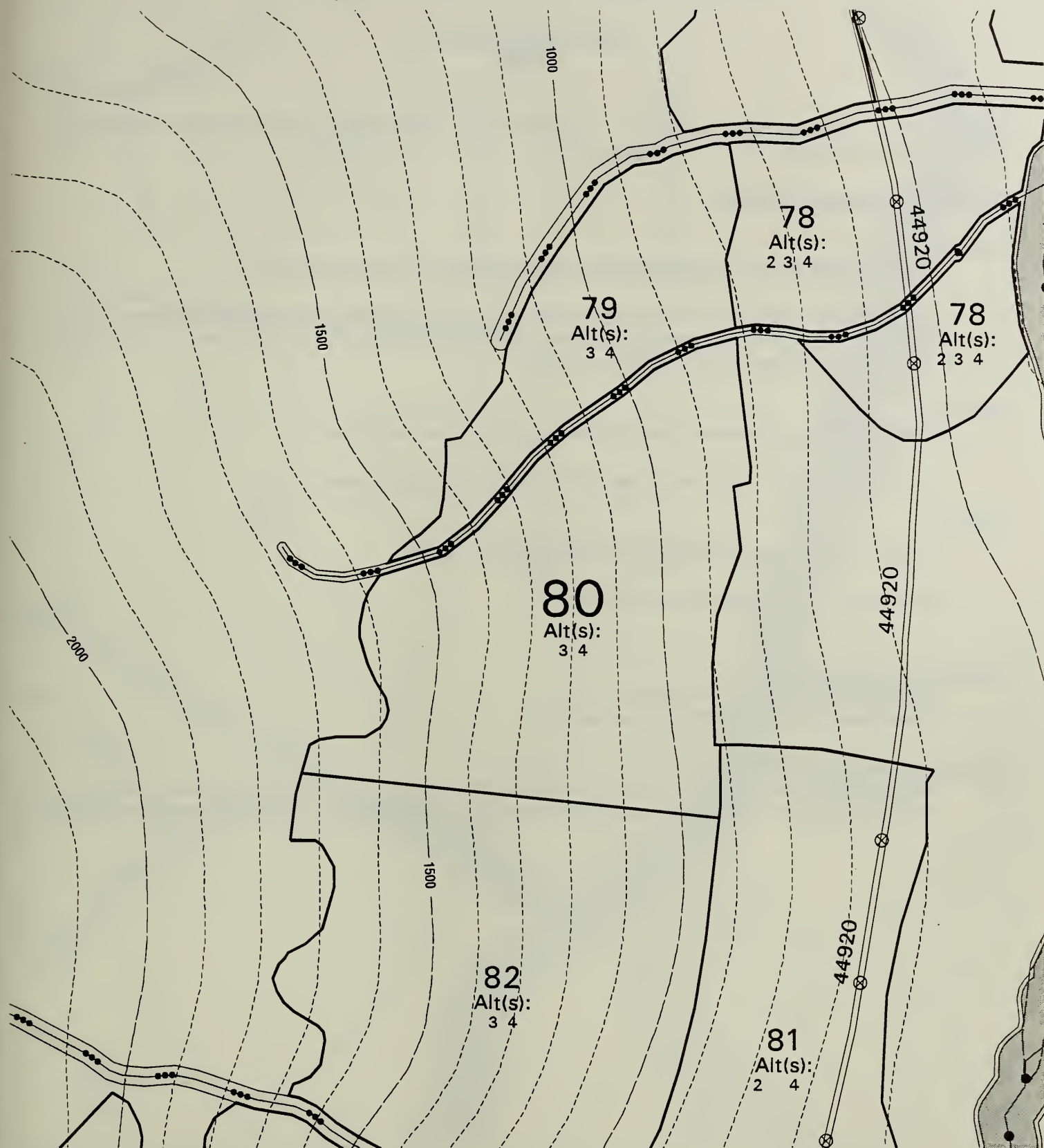
Group Selection - 30% removal (Alternative 3)

Group Selection - 10% removal (Alternative 4)

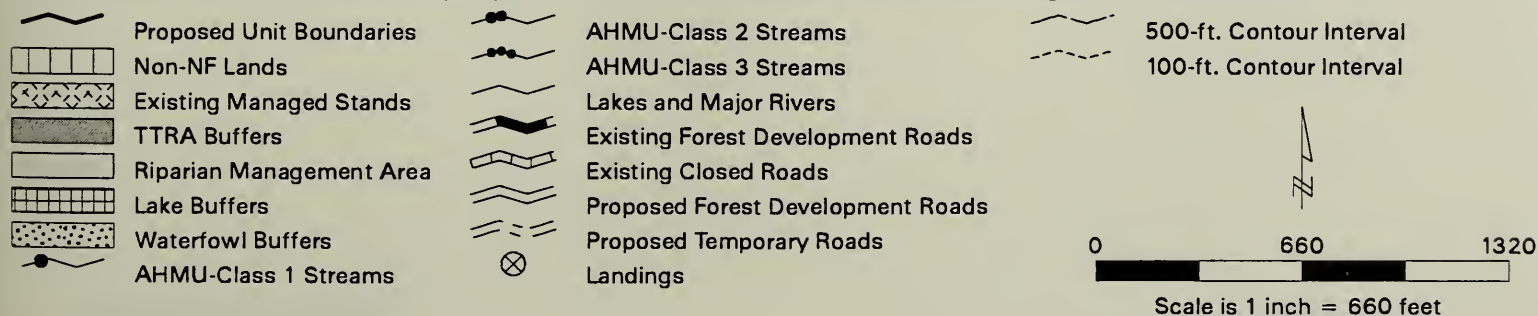
**Logging System and Unit Design**

North boundary follows Class III stream V-notch. East boundary follows slope break. Unit is planned for helicopter logging utilizing landings in Units 78 and 81.

# Crystal Creek Timber Harvest Unit 80



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 81**

Acres: 61      Alternative (s): 2 and 4      MBF Volume: 1193 and 421      MCF Volume : 327 and 115  
1977 Aerial Photo: Flight #: 53      Photo #: 103

**Resource Concerns and Mitigation**

**Fisheries**

Concern: High Gradient Contained Class II stream channels to the south of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

**Hydrology**

Concern: Existing blowdown pattern indicates some blowdown could occur.

Mitigation: Feather Class II and III stream buffers to protect against blowdown.

**Wetlands**

Concern: Forest wetland, maybeso series soils, along west border.

Mitigation: Unit is designed to avoid these soils.

**Silvicultural Prescription**

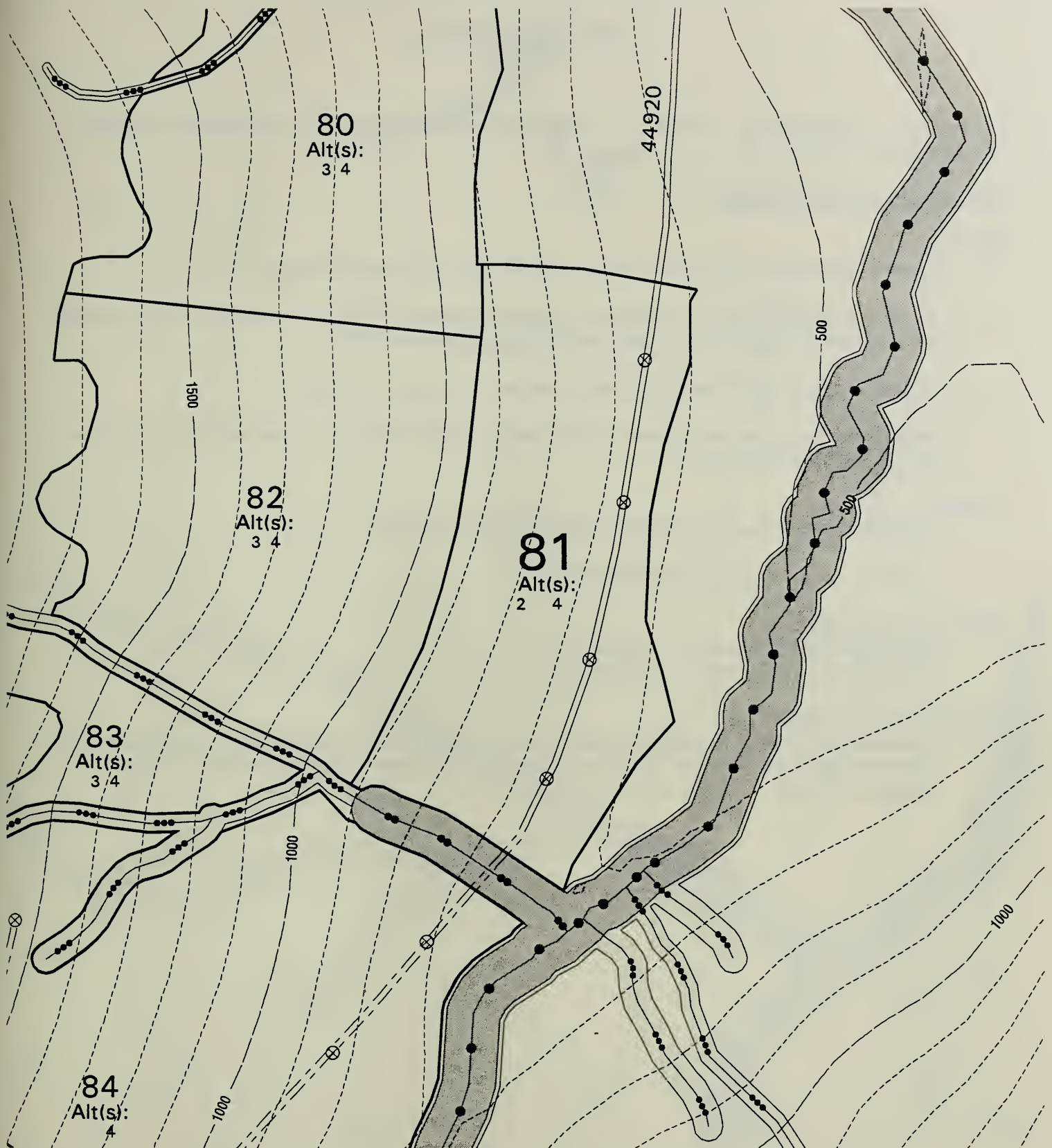
Clearcut with reserves (Alternative 2)

Group Selection - 30% removal (Alternative 4)

**Logging System and Unit Design**

West boundary is designed to follow slope break which is common with Unit 82. East boundary follows muskeg chain to the south Class II stream buffer boundary. Cable logging is planned from multiple landings.

# Crystal Creek Timber Harvest Unit 81



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**

**Unit 82**

Acres: 74      Alternative (s): 3 and 4      MBF Volume: 635 and 212      MCF Volume: 162 and 54  
1977 Aerial Photo: Flight #: 53      Photo #: 103

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit.

Mitigation: Avoid helicopter overflights of the alpine/subalpine area to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

Concern: High Gradient Contained, Class III channels to the south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Wetlands**

Concern: Forest wetland, maybeso series soils, along northwest border.

Mitigation: Unit is designed to avoid these soils.

**Silvicultural Prescription**

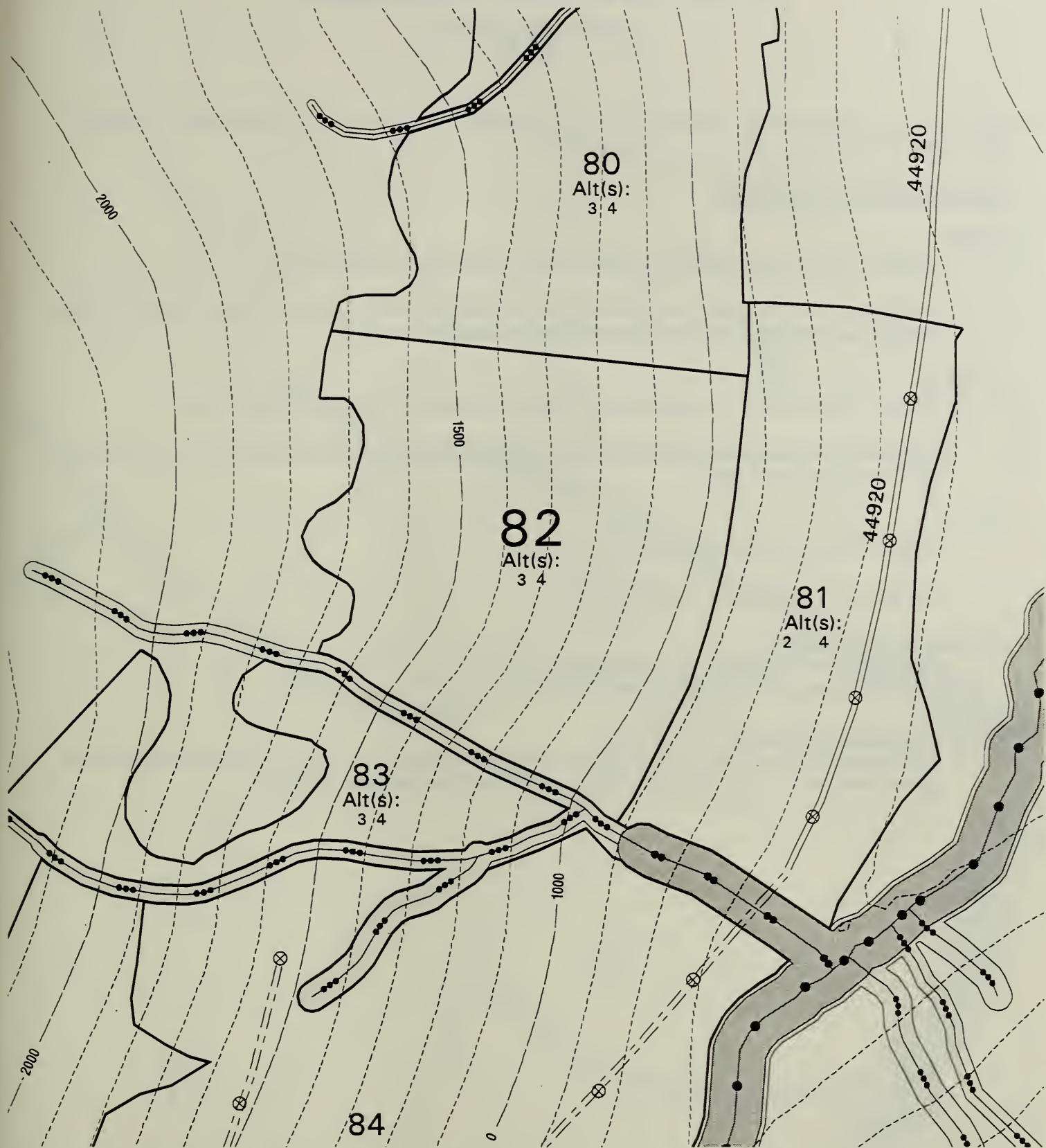
Group Selection - 30% removal (Alternative 3)

Group Selection - 10% removal (Alternative 4)

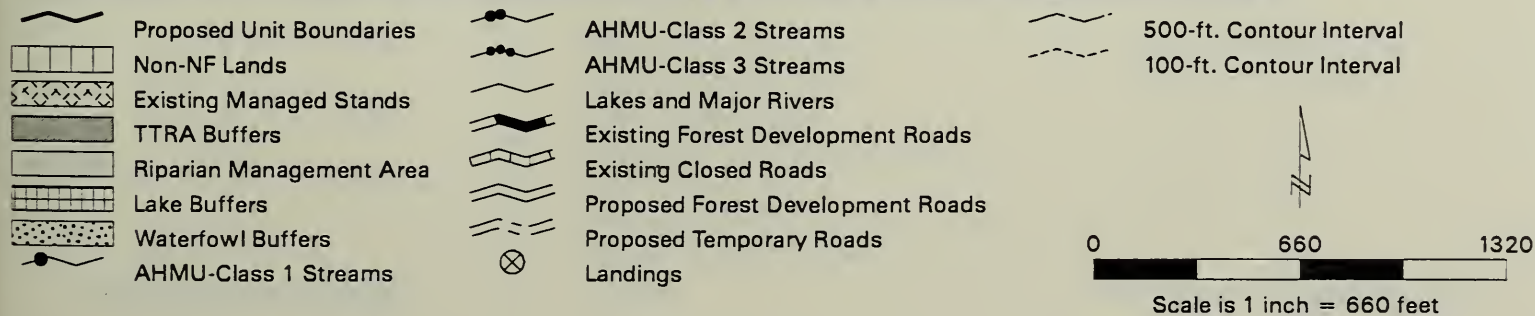
**Logging System and Unit Design**

North and east boundary common with Units 80 and 81. South boundary follows Class III stream buffer and northwest boundary follows forested wetland soil type. Unit is planned for helicopter logging utilizing landings in Unit 81.

# Crystal Creek Timber Harvest Unit 82



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 83**

Acres: 26      Alternative (s): 3 and 4      MBF Volume: 211 and 70      MCF Volume : 55 and 18  
1977 Aerial Photo: Flight #: 53      Photo #: 103

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit.

Mitigation: Avoid helicopter overflights of the alpine/subalpine area to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north and south of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Wetland**

Concern: Unit surrounds wetland maybeso soils.

Mitigation: Unit is designed to avoid these soils.

**Silvicultural Prescription**

Group Selection - 30% removal (Alternative 3)

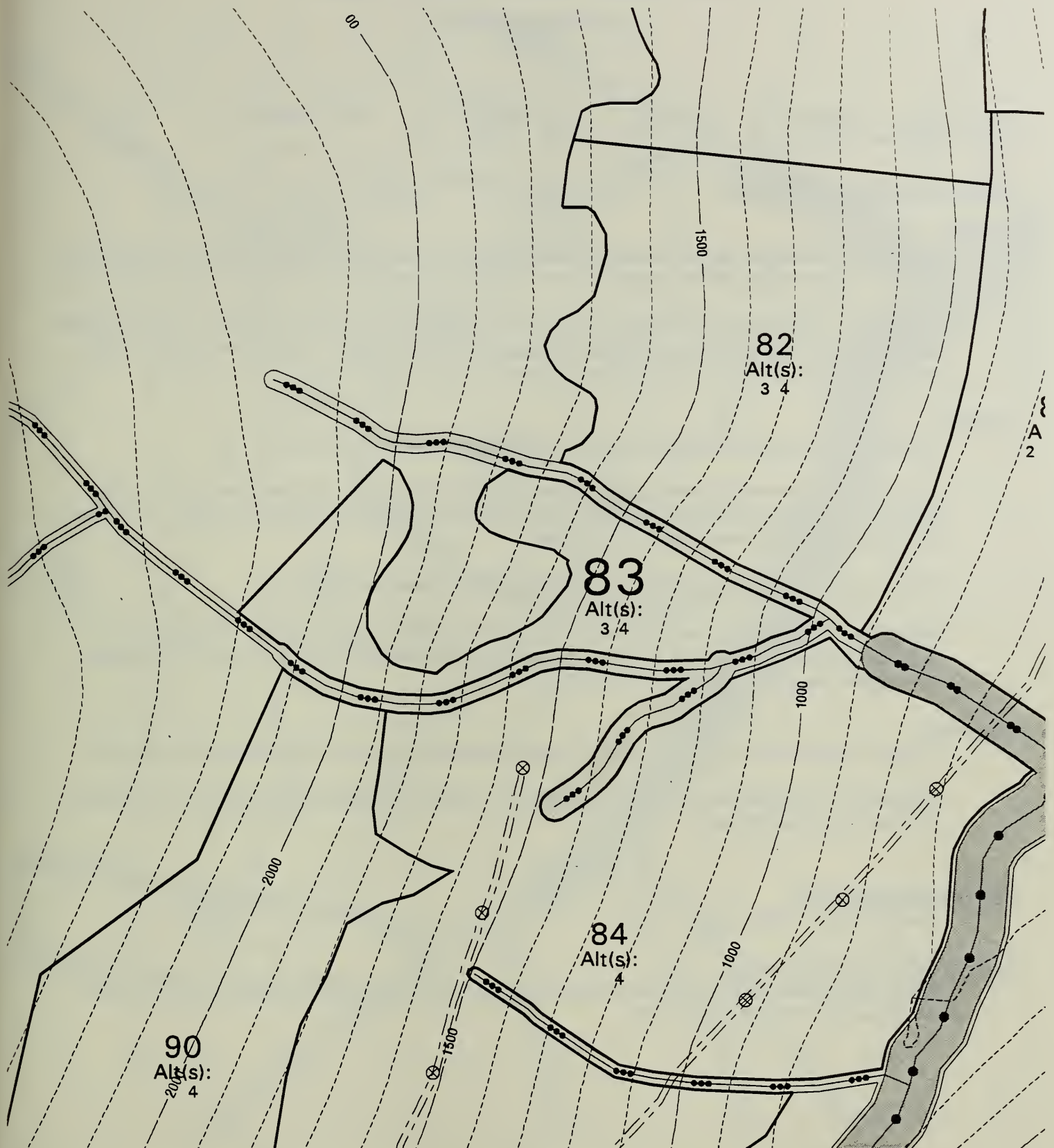
Group Selection - 10% removal (Alternative 4)

**Logging System and Unit Design**

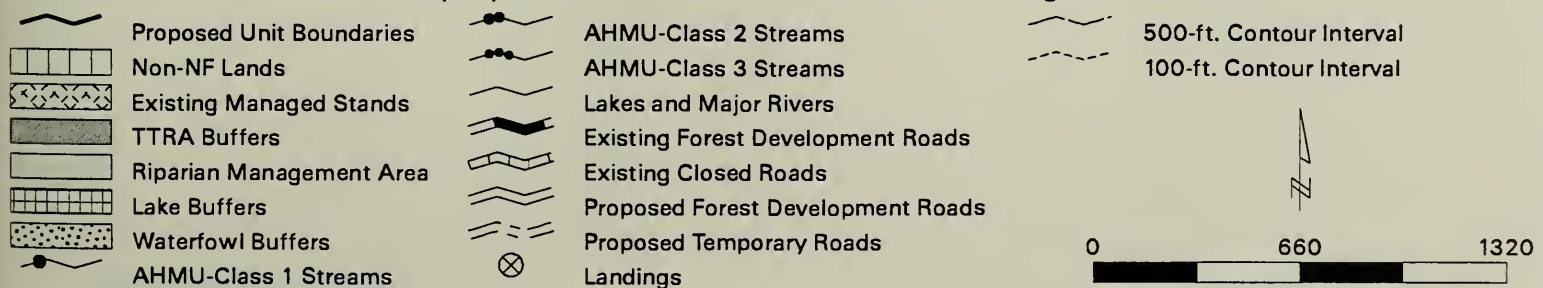
Unit boundary follows Class III stream buffer V-notches on the north and east sides. West boundary follows forested wetland soil type. Helicopter logging planned utilizing landings in Unit 81.



# Crystal Creek Timber Harvest Unit 83



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 84**

Acres: 182      Alternative (s): 4  
1977 Aerial Photo: Flight #: 53

MBF Volume: 525  
Photo #: 103

MCF Volume : 132

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit. Goat winter use within the unit and goat kidding area/spring use at the headwaters of Crystal Creek to the north and west of the unit.

Mitigation: Avoid helicopter overflights of the alpine/subalpine area to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units. Prohibit tree falling, yarding, and road construction within the unit during the period January 1 to June 15.

**Fisheries**

Concern: High Gradient Contained Class II stream channels to the north of the unit.

Mitigation: No commercial timber harvest within 100 feet of the channel. No programmed commercial timber harvest within the Riparian Management Area, defined as within 100 feet of the stream or to the top of the V-notch (side-slope break) whichever is greater.

Concern: Moderate Gradient/Mixed Control, Class I stream channel east of the unit.

Mitigation: No commercial timber harvest within 100 feet of Class I stream channel. No programmed commercial timber harvest in the Riparian Management Area (greatest of flood plain, riparian vegetation or soil, riparian associated wetland fens, or 120 feet.

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north, south and middle of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Silvicultural Prescription**

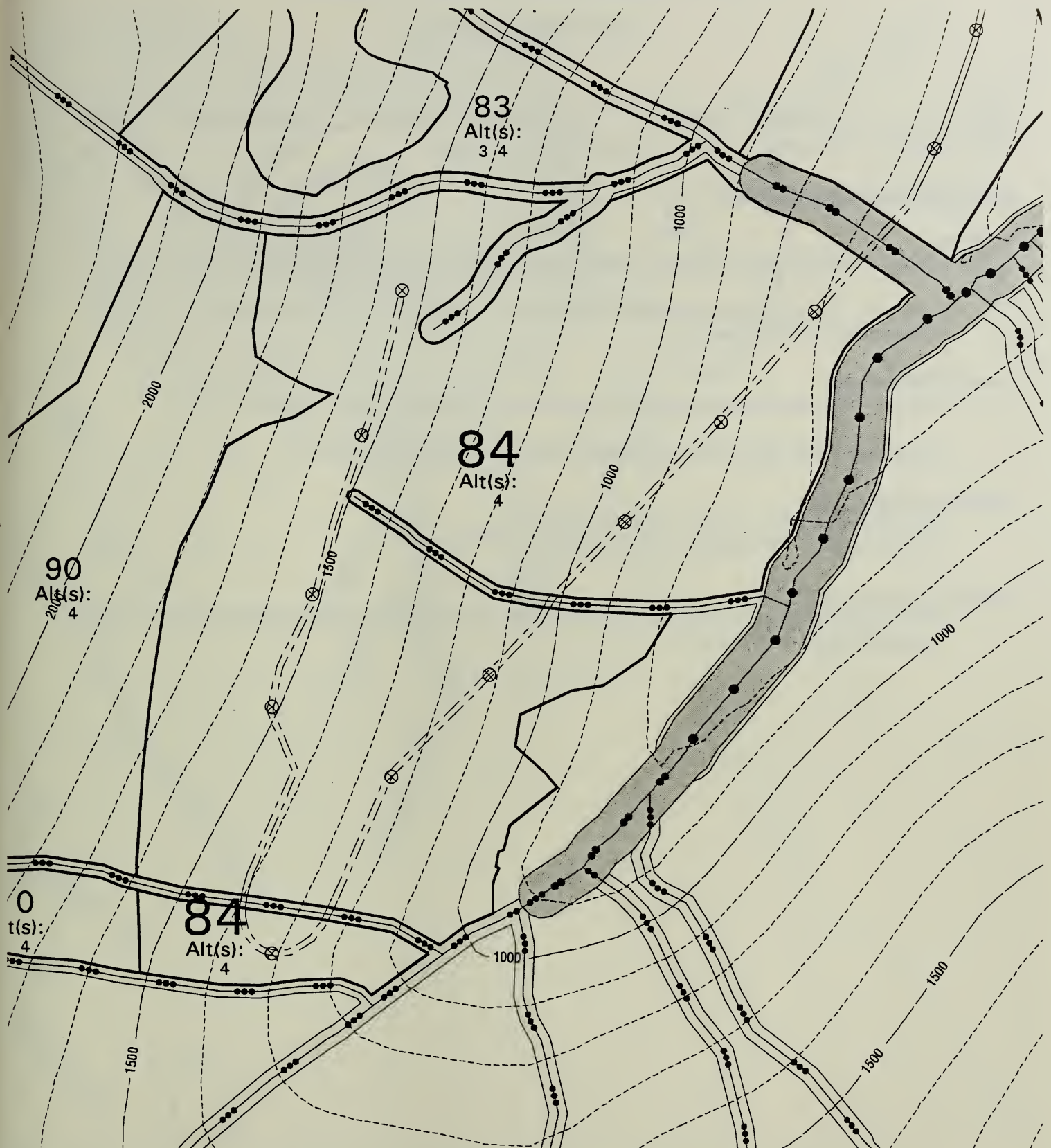
Group Selection - 10% removal

**Logging System and Unit Design**

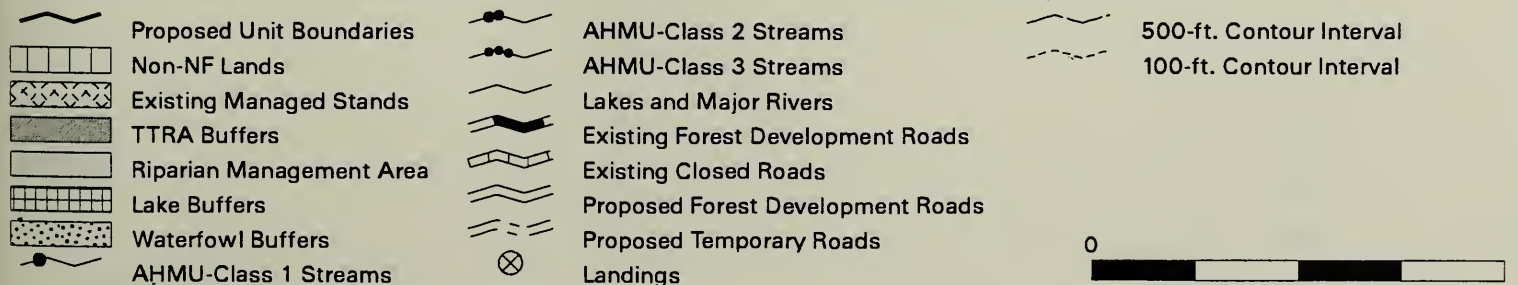
Skyline cable system planned. Maintain adequate buffers along Class I and III stream buffers which border north, east, and south sides of the unit.



# Crystal Creek Timber Harvest Unit 84



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 85**

Acres: 14      Alternative (s): 2 and 5      MBF Volume: 113 and 151      MCF Volume : 29 and 38  
1977 Aerial Photo: Flight #: 53      Photo #: 96

**Resource Concerns and Mitigation**

**Hydrology**

Concern: High Gradient Contained, Class III stream channels to the north, south and middle of the unit.

Mitigation: No programmed commercial timber harvest within the Riparian Management Area, defined as the V-notch (side-slope break).

**Landslide Prone Soils**

Concern: Two small inclusions along northern border with isolated areas of steep slope.

Mitigation: Retain some trees on the steeper slopes to maintain slope stability.

**Silvicultural Prescription**

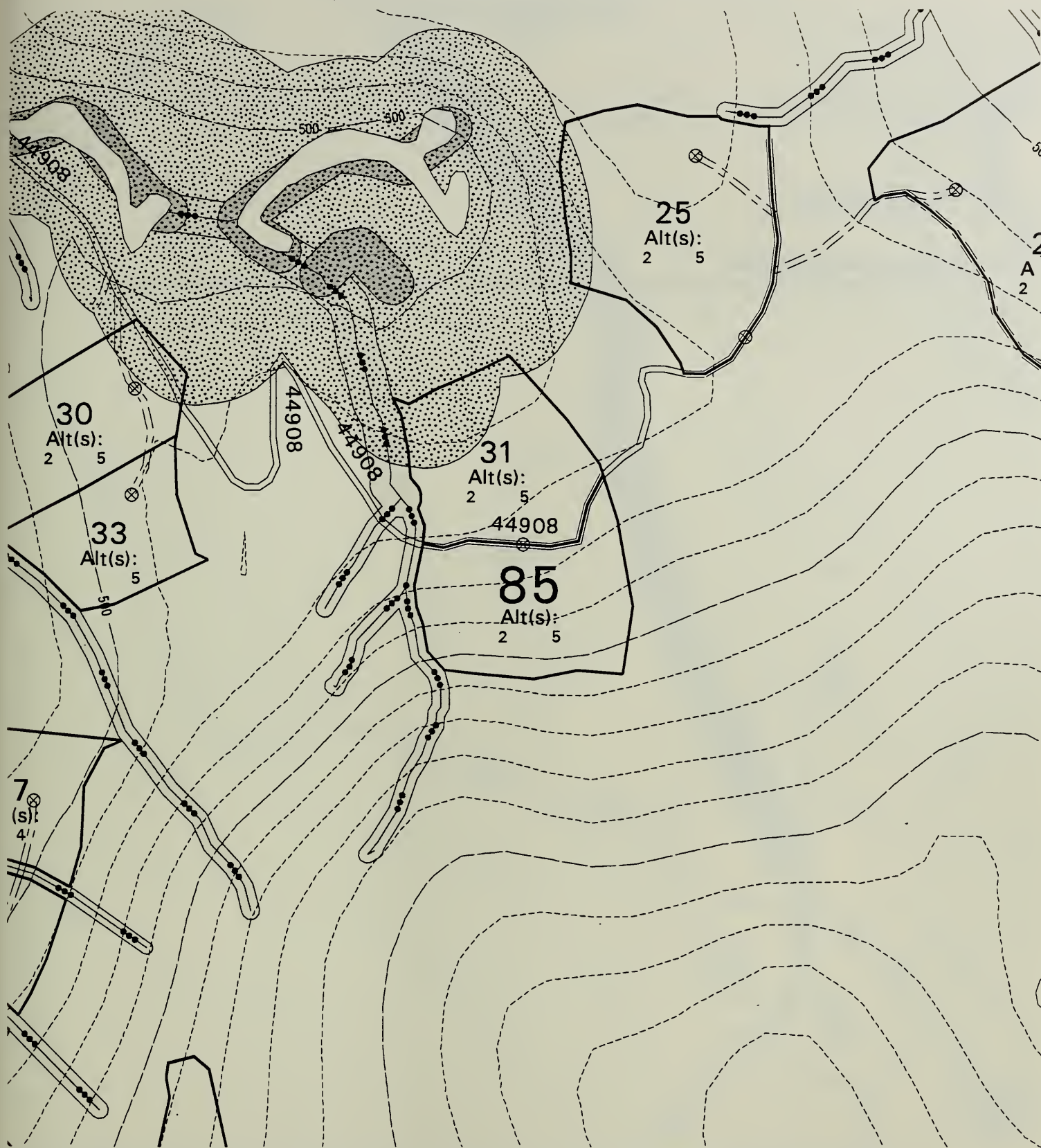
Group Selection - 30% removal (Alternative 2)

Group Selection - 40% removal (Alternative 5)

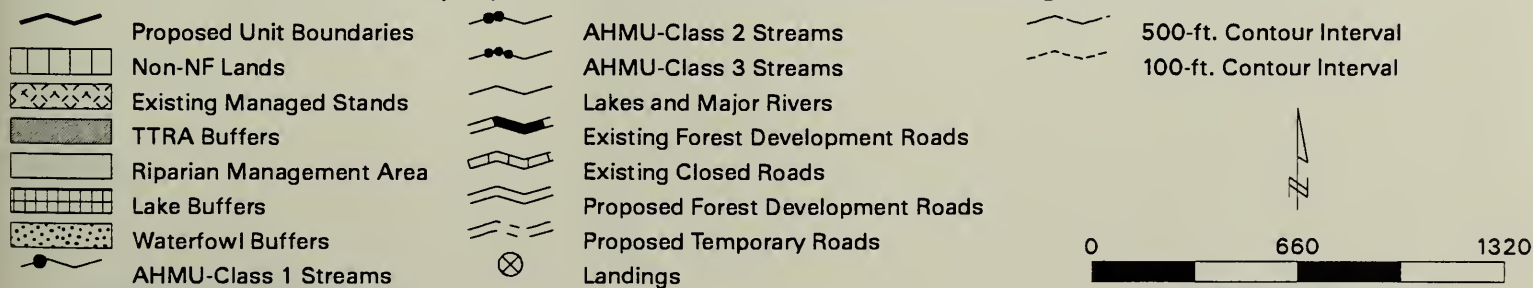
**Logging System and Unit Design**

Unit is designed for cable yarding from specified road. Class III stream borders west boundary and south boundary follows slope break.

# Crystal Creek Timber Harvest Unit 85



Alternatives that include the proposed units are listed beneath the larger unit numbers.



Scale is 1 inch = 660 feet

**Crystal Creek Unit Card**

**Unit 86**

Acres: 14      Alternative (s): 2, 3, and 4  
1977 Aerial Photo: Flight #: 53      Photo #: 99

MBF Volume: 226

MCF Volume : 65

**Silvicultural Prescription**

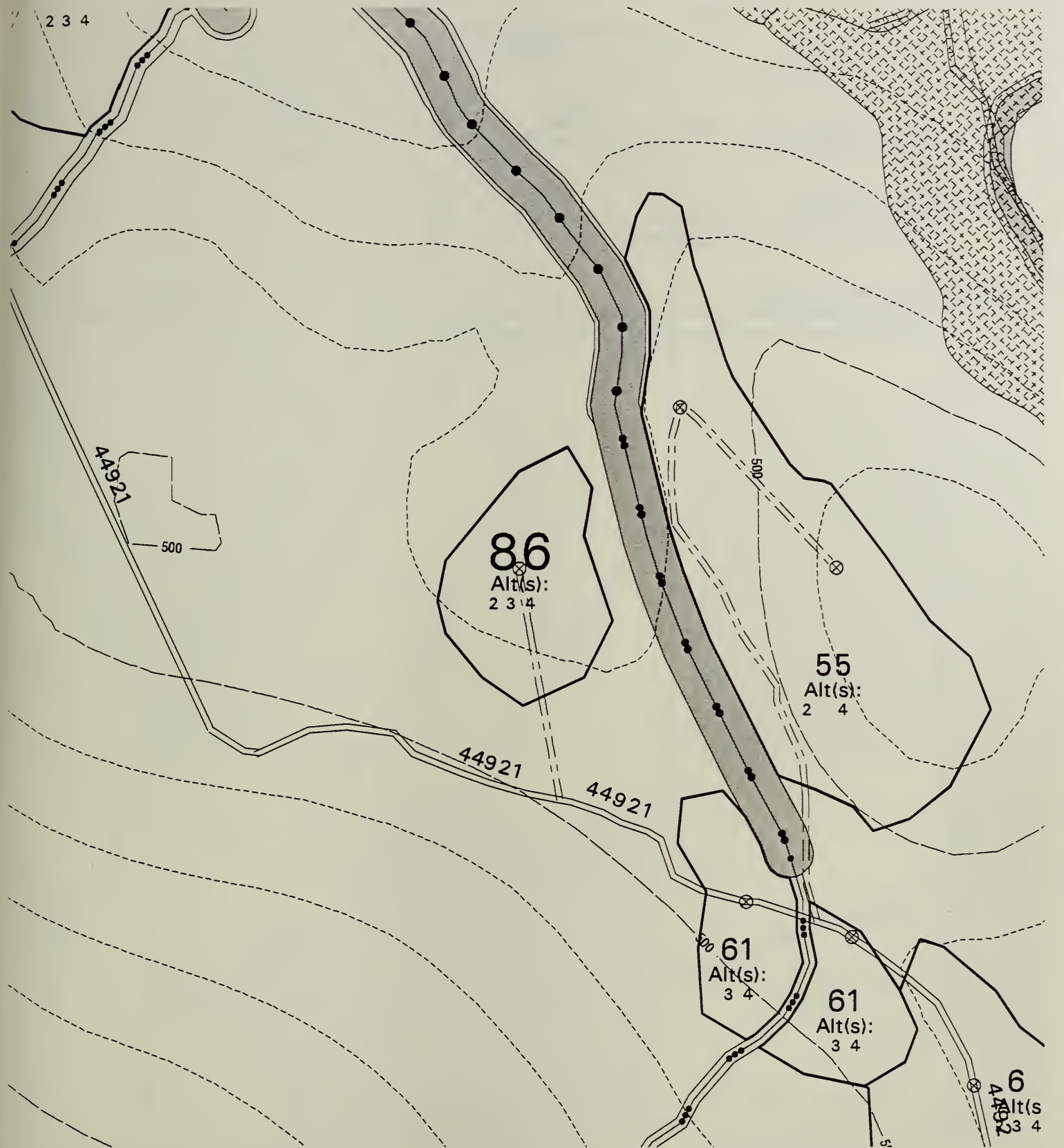
Clearcut with reserves

**Logging System and Unit Design**

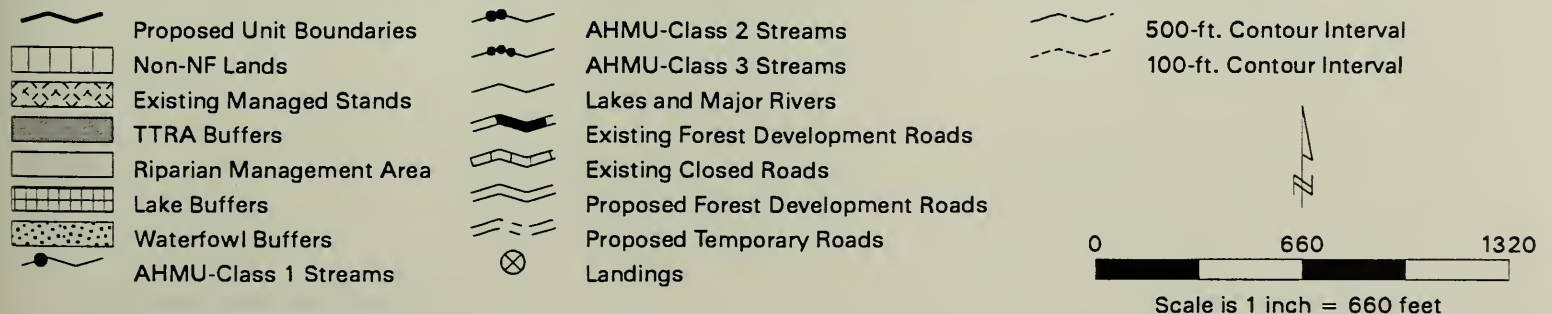
Unit is accessed by temporary road and is planned for shovel logging. Unit design follows low volume timber.



# Crystal Creek Timber Harvest Unit 86



Alternatives that include the proposed units are listed beneath the larger unit numbers.



**Crystal Creek Unit Card**  
**Unit 87**

Acres: 46      Alternative (s): 4 and 5      MBF Volume: 261 and 1109      MCF Volume: 67 and 283  
1977 Aerial Photo: Flight #: 49      Photo #: 154

**Silvicultural Prescription**

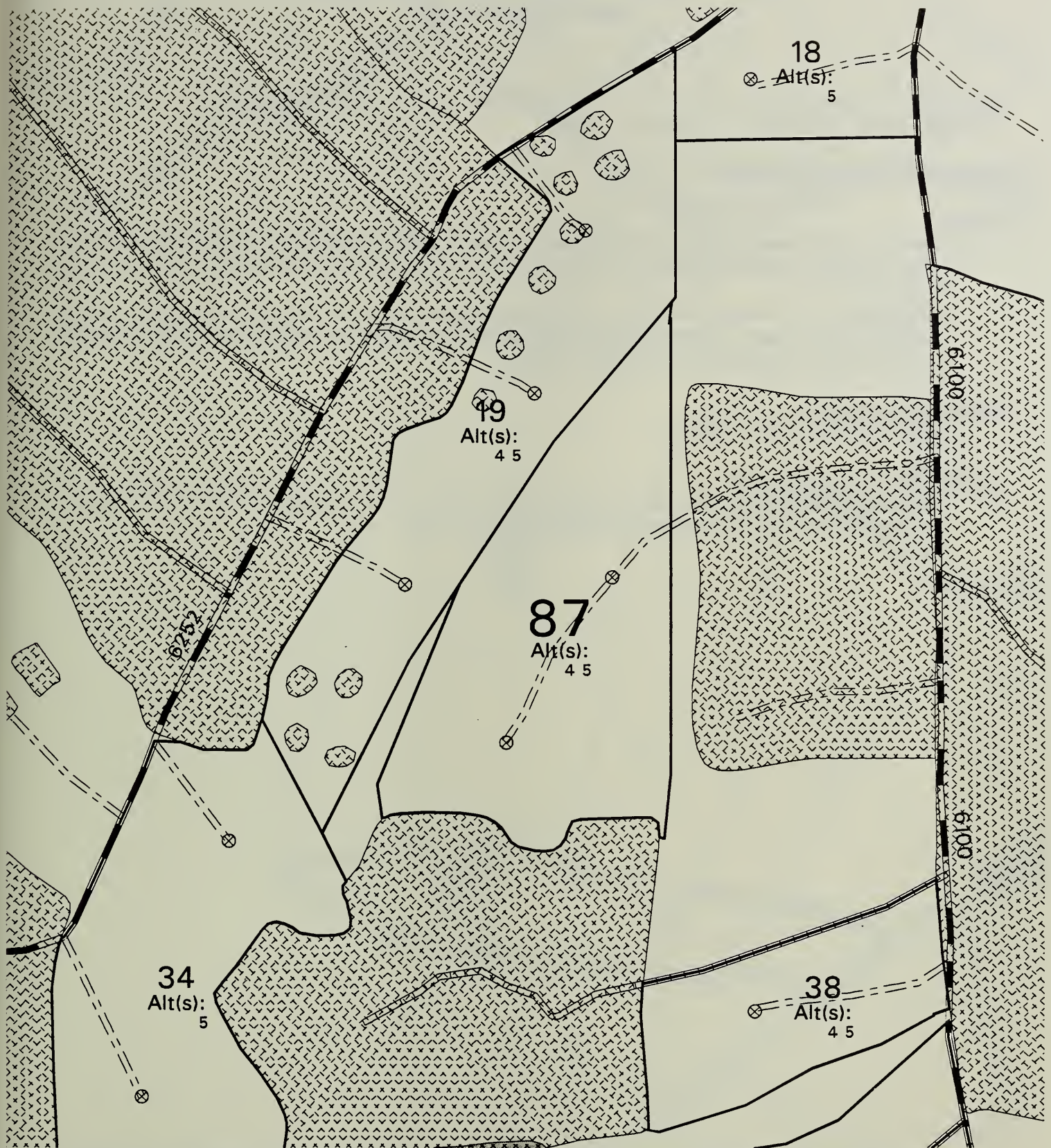
Single-tree Selection - 20% removal (Alternative 4)  
Clearcut with reserves (Alternative 5)

**Logging System and Unit Design**

Unit is designed to have common boundaries with managed stands and Unit 19. Temporary road is planned to minimize shovel yarding distance reducing soil disturbance.



# Crystal Creek Timber Harvest Unit 87



Alternatives that include the proposed units are listed beneath the larger unit numbers.





**Crystal Creek Unit Card**  
**Unit 90**

Acres: 87      Alternative (s): 4  
1977 Aerial Photo: Flight #: 53

MBF Volume: 231  
Photo #: 103

MCF Volume: 58

**Resource Concerns and Mitigation**

**Wildlife**

Concern: Goat summer range in the alpine/subalpine habitat to the west of the unit. Goat winter use within the unit and goat kidding area/spring use at the headwaters of Crystal Creek to the north and west of the unit.

Mitigation: Avoid helicopter overflights of the alpine/subalpine area to the west of the unit. Limit helicopter landings used by logging crews to designated landings adjacent to the units. Prohibit tree falling and yarding within the unit during the period January 1 to June 15.

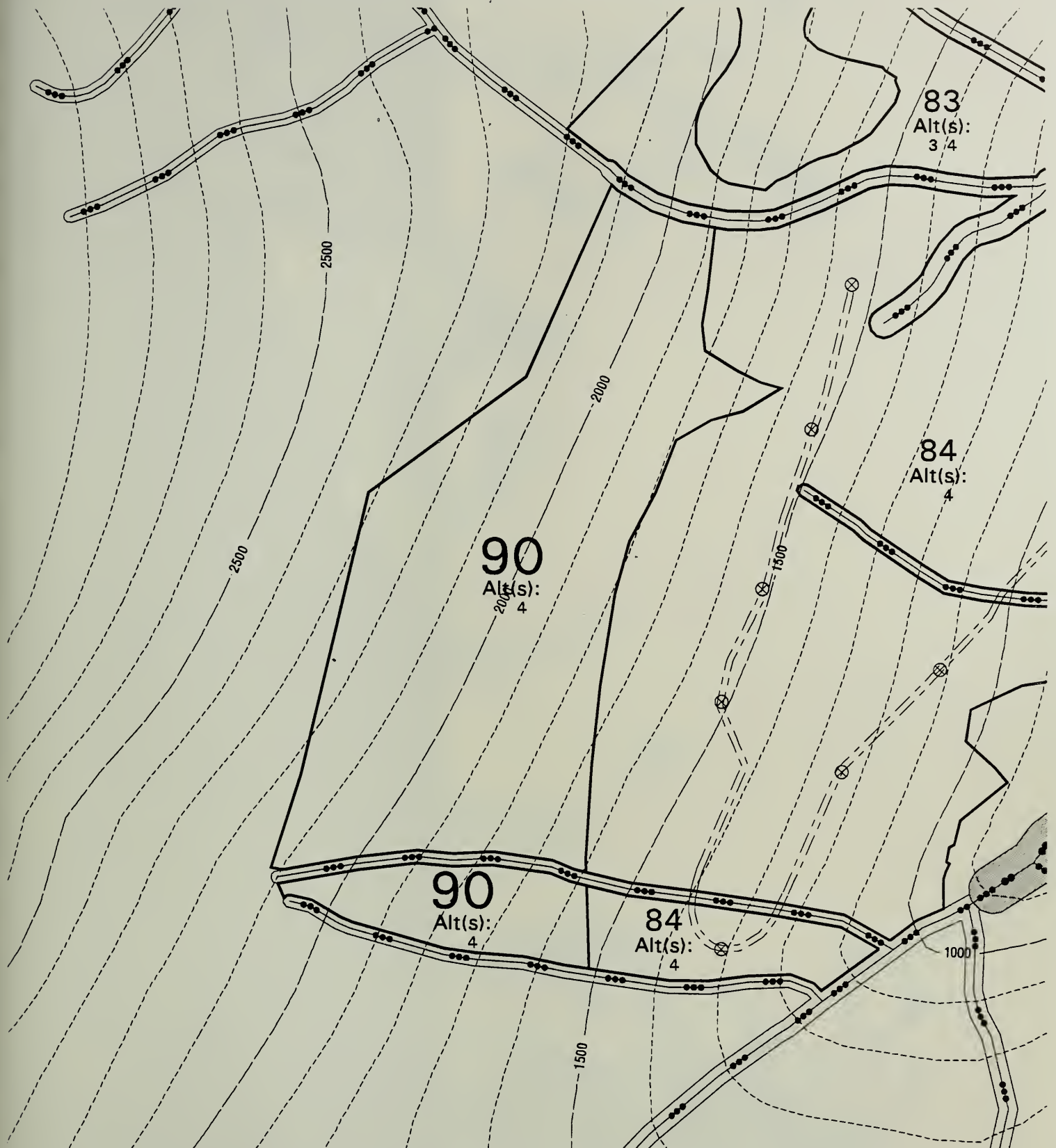
**Silvicultural Prescription**

Group Selection - 10% removal

**Logging System and Unit Design**

Unit design follows slope breaks and low volume timber; north and south boundaries follow Class III stream buffers. Helicopter logging is planned utilizing landings in Unit 84.

# Crystal Creek Timber Harvest Unit 90



Alternatives that include the proposed units are listed beneath the larger unit numbers.

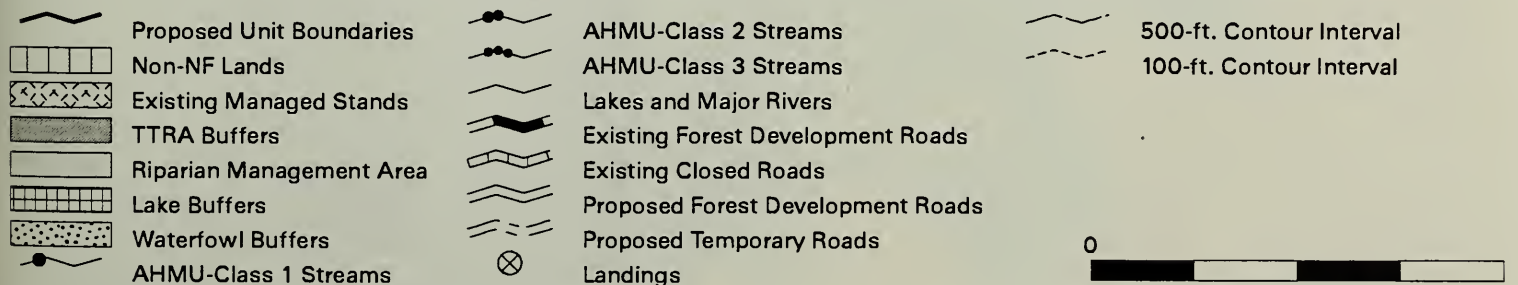






Figure B-2  
Crystal Creek Project Area  
Transportation Plan



- Low-Site Forest
- Productive Forest
- Non-NF Lands
- Managed Stands
- Freshwater
- Saltwater
- Streams
- Highways
- All Vehicle Roads
- High Clearance Roads
- Closed Roads
- Closed Non-System Roads
- Planned System Roads
- Non-NF Roads
- Contour Interval: 100 ft
- Proposed Specified Roads
- Proposed Temporary Roads
- Log Transfer Facility

0 5280 10560  
Scale is 1 inch = 5280 feet

h:\1\gis\projects\crystal\plots\deis\plots2\trans\_plan.map 07/11/97





# Road Cards

The following summary includes existing and proposed road descriptions. The proposed road descriptions are based on information gathered during field reconnaissance and would be used for the final location, survey and construction of roads in the selected alternative. Soil and water resource protection measures were considered when locating the roads. The avoidance of unstable, sensitive, and fragile areas were primary considerations incorporated into the location of these roads. In addition to the following Road Descriptions, more detailed information is found in the planning file. The road descriptions contain the Travelway Management Prescriptions (see Figure B-1 for road location).

**Road Closures:** The primary roads within the project area are Forest Road 6256 which runs from the Thomas Bay log transfer/gravel barge facility south and east along the Muddy River; Forest Road 6101 which runs east and west south of the Patterson River; and Forest Road 6252 which connects Point Agassiz to Forest Road 6256. Portions of Forest Road 6256 will be reconstructed. These roads will remain open to public motorized travel.

All new roads constructed will be closed following timber harvest activities. To accomplish this, drainage structures will be removed, waterbars will be constructed, and any needed erosion control measures will be taken. Some incidental all terrain vehicle use is expected on at least some of these roads following closure. A motorized closure during timber harvest will be enforced on Forest Roads 44920 and 44921 located in the Crystal Creek/Brown Cove Lake (Long Lake) watersheds. This restriction is needed to protect mountain goat habitat in the Horn Cliffs area.



## EXISTING ROAD DESCRIPTION

Road Number: 6100	Road Name: Mud	
Termini: Junction Rd 6252 to Section 21	Entry Cycle: Constant	
Length (miles): 3.1	VCU: 487	
Functional Class/Travel Class: Local / 5	Width (ft): 14	
Service Life: Long Term	Design Vehicle: Logging Truck	Critical Vehicle: Logging Truck
Traffic Service Level: C	Highway Safety Act: Yes	
Maintenance Levels:	Operational: 3	Objective: 3

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road is designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

Any or all modes of travel may be prohibited on a seasonal basis to protect resources or to feature a particular use.

### Travelway Management Strategies

<b>Encourage:</b>	All licensed vehicles, bicycles, hikers
<b>Accept:</b>	Off highway vehicles, ATVs
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	N/A

## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns were cited.

## EXISTING ROAD DESCRIPTION

Road Number: 6101	Road Name: Patterson River	
Termini: Junction Rd 6256 to Section 1	Entry Cycle: Constant	
Length (miles): 3.6	VCU: 487	
Functional Class/Travel Class: Local / 5	Width (ft): 14	
Service Life: Long Term	Design Vehicle: Logging Truck	Critical Vehicle: Logging Truck
Traffic Service Level: D	Highway Safety Act: No	
Maintenance Levels:	Operational: 2	Objective: 2

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road is designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment. The roadway entrance will be roughened to discourage low clearance vehicles.

Any or all modes of travel may be prohibited on a seasonal basis to protect resources or to feature a particular use.

### Travelway Management Strategies

<b>Encourage:</b>	High clearance vehicles - bicycles, hikers
<b>Accept:</b>	Off highway vehicles
<b>Discourage:</b>	Low clearance vehicles
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	N/A



## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns were cited.

## EXISTING ROAD DESCRIPTION

<b>Road Number:</b> 6103	<b>Road Name:</b> Pirate's Peak	
<b>Termini:</b> Thomas Bay - Sec.6		<b>Entry Cycle:</b> Constant
<b>Length (miles):</b> 3.8	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 7		<b>Width (ft):</b> 14
<b>Service Life:</b> Long Term	<b>Design Vehicle:</b> Logging Truck	
		<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D	<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>	<b>Operational:</b> Abandoned	<b>Objective:</b> Storage

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road was designed as a single lane with some turnouts. The road currently is closed to all passenger/pickup sized vehicles.

Any or all modes of travel may be prohibited on a seasonal basis to protect resources or to feature a particular use.

### Travelway Management Strategies

<b>Encourage:</b>	Bicycles, hikers
<b>Accept:</b>	ATVs
<b>Discourage:</b>	Off highway vehicles
<b>Prohibit:</b>	N/A
<b>Eliminate:</b>	Highway class vehicles

## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns were cited.



## EXISTING ROAD DESCRIPTION

<b>Road Number:</b> 6252		<b>Road Name:</b> Point Agassiz
<b>Termini:</b> Point Agassiz to 6256		<b>Entry Cycle:</b> Constant
<b>Length (miles):</b> 4.1	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Collector / 4		<b>Width (ft):</b> 14
<b>Service Life:</b> Long Term		<b>Design Vehicle:</b> Passenger Car
<b>Traffic Service Level:</b> C		<b>Critical Vehicle:</b> Logging Truck
<b>Maintenance Levels:</b>		<b>Highway Safety Act:</b> Yes
		<b>Operational:</b> 3
		<b>Objective:</b> 3

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road was designed as a single lane with some turnouts. Except during scheduled periods, extreme weather conditions, or emergencies this road is open to the general public for use by a standard passenger auto, without restrictive gates or prohibitive signs or regulations, other than general traffic control or restrictions based on size, weight, or class of registration.

### Travelway Management Strategies

<b>Encourage:</b>	All licensed vehicles, bicycles, hikers
<b>Accept:</b>	ATVs, Off-highway vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	N/A
<b>Eliminate:</b>	N/A

## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns were cited.

## EXISTING ROAD DESCRIPTION

<b>Road Number:</b> 6256		<b>Road Name:</b> Muddy River
<b>Termini:</b> LTF - MP 1.25		<b>Entry Cycle:</b> Constant
<b>Length (miles):</b> 1.25	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Collector / 4		<b>Width (ft):</b> 20
<b>Service Life:</b> Long Term		<b>Design Vehicle:</b> Passenger Car
<b>Traffic Service Level:</b> B		<b>Critical Vehicle:</b> Lowboy
<b>Maintenance Levels:</b>		<b>Highway Safety Act:</b> Yes
		<b>Operational:</b> 4
		<b>Objective:</b> 4

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access. The road has widened over time. Gravel trucks hauling from the quarry at MP 1.25 dominate current use.

### Travelway Management Prescription

This road was designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment. Except during scheduled periods, extreme weather conditions, or emergencies this road is to remain open to the general public for use by a standard passenger auto, without restrictive gates or prohibitive signs or regulations, other than general traffic control or restrictions based on size, weight, or class of registration.

### Travelway Management Strategies

<b>Encourage:</b>	Highway passenger vehicles - bicycles, hikers
<b>Accept:</b>	Off highway vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	N/A
<b>Eliminate:</b>	N/A



## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns were cited.

## EXISTING ROAD DESCRIPTION

<b>Road Number:</b> 6256		<b>Road Name:</b> Muddy River	
<b>Termini:</b> 1.25 - 8.90 (Top of pass)		<b>Entry Cycle:</b> Constant	
<b>Length (miles):</b> 7.65		<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Collector / 4		<b>Width (ft):</b> 16	
<b>Service Life:</b> Long Term		<b>Design Vehicle:</b> Passenger Car	<b>Critical Vehicle:</b> Lowboy
<b>Traffic Service Level:</b> C		<b>Highway Safety Act:</b> Yes	
<b>Maintenance Levels:</b>		<b>Operational:</b> 3	<b>Objective:</b> 3

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road was designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment. Except during scheduled periods, extreme weather conditions, or emergencies this road is to remain open to the general public for use by a standard passenger auto, without restrictive gates or prohibitive signs or regulations, other than general traffic control or restrictions based on size, weight, or class of registration.

### Travelway Management Strategies

<b>Encourage:</b>	Passenger vehicles - bicycles, hikers
<b>Accept:</b>	Off highway vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	N/A
<b>Eliminate:</b>	N/A

## **RESOURCE PRESCRIPTIONS**

### **ROAD: 6256**

#### **Watershed/Fisheries:**

This segment of road 6256 parallels the Muddy River. All in-stream work will be done within the timing window.

Timing: Prohibit in stream disturbance from August 15 through June 30.

#### **Wildlife Biodiversity:**

Adjacent to the areas proposed for river bank stabilization is a large waterfowl marsh. Ducks, geese and swans are known to occupy the area. Reconstruction should leave a vegetative buffer between the road and marsh.

Timing: Road reconstruction will be prohibited between October 15 and April 15 between mile post 7.2 and 8.9.

#### **Rock Borrow Sites:**

There are several existing gravel borrow pits in the area.

#### **Erosion Control:**

Between mile posts 7.2 and 8.9, three areas of existing Road 6256 have been eroded away by the Muddy River. Road reconstruction and bank stabilization is proposed for these areas. Between mile post 8.0 and 8.9 a stream has run down the road causing erosion damage. The road will be reconstructed and the water course stabilized.



## EXISTING ROAD DESCRIPTION

<b>Road Number:</b> 6256	<b>Road Name:</b> Muddy River	
<b>Termini:</b> 6.80 - 9.60 (North Fork Muddy River)		<b>Entry Cycle:</b> Intermittent
<b>Length (miles):</b> 2.80	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 5		<b>Width (ft):</b> 14
<b>Service Life:</b> Long Term	<b>Design Vehicle:</b> Logging Truck	<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D	<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>	<b>Operational:</b> 2	<b>Objective:</b> 2

**Intended Purpose:** This road was constructed to access earlier logging activities and provide forest management access.

### Travelway Management Prescription

This road was designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment. Any or all modes of travel may be prohibited on a seasonal basis to protect resources or to feature a particular use.

### Travelway Management Strategies

<b>Encourage:</b>	High clearance vehicles - bicycles, hikers
<b>Accept:</b>	Off highway vehicles
<b>Discourage:</b>	Low clearance vehicles
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	N/A

## RESOURCE CONSIDERATIONS AND MITIGATIONS

No concerns cited.

## PLANNED ROAD DESCRIPTIONS

<b>Road Number:</b> 44900	<b>Road Name:</b> Terminal	
<b>Termini:</b> MP 0.5 Road 6256 to Section 6		<b>Entry Cycle:</b> Intermittent
<b>Length (miles):</b> 2.64	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 7		<b>Width (ft):</b> 14
	<b>Design Vehicle:</b> Logging Truck	
<b>Service Life:</b> Long Term		<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D	<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>	<b>Operational:</b> 2	<b>Objective:</b> Storage

**Intended Purpose:** This road provides forest management access. It will be not be needed for timber management within the foreseeable future and will be placed in storage after proposed use is completed. A log sort yard is proposed on National Forest property at approximate mile post 0.50

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

### Travelway Management Strategies

<b>Encourage:</b>	Bicycles, hikers and other non-motorized transportation.
<b>Accept:</b>	All Terrain Vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	Unauthorized motorized vehicles when in storage.



## RESOURCE PRESCRIPTIONS

### Road : 44900

#### Watershed/Fisheries:

There are two areas where the road crosses muskeg. The first area the road skirts along the tree fringe (approximately 300 feet) of a small muskeg and a series of small ponds. This location avoids a 15 to 20 foot through-cut in a terminal moraine. At the second area the road skirts along the edge of a small muskeg for approximately 200 feet to avoid steep grades.

The road crosses 2 Class I streams at approximate mile posts 1.15 and 2.00.

Timing: Prohibit in stream disturbance, on both streams, from August 15 through May 15 to protect incubating salmon eggs.

#### Wildlife Biodiversity:

There are geese nesting on the larger ponds north of the proposed road.

Timing: Restrict road construction during April 1 through June 30 on that segment of road from the edge of the existing clearcut, mile post 0.85, to the stream at mile post 1.15.

**Rock Borrow Sites:** The road traverses adjacent to a terminal moraine from mile post 0.85 to mile post 2.2. Composition is mostly granite boulders but there is some shale type material.

#### Major Stream Crossings:

Mile Post	1.15	2.00
Stream Class	I	I
Structure	30 foot bridge	12 foot bridge
Stream Width	20 feet	8 feet
Stream Depth	3 feet	< 1 foot
Substrate	Mud	Gravels/Cobbles
Bank Height	< 3 feet	< 3 feet
Fish Habitat	Rearing	Rearing
Stream Gradient	< 3%	5%

## PLANNED ROAD DESCRIPTIONS

<b>Road Number:</b> 44905		<b>Road Name:</b> Hog Back	
<b>Termini:</b> Road 6101 - Sec. 13		<b>Entry Cycle:</b> Intermittent	
<b>Length (miles):</b> 1.68		<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 7		<b>Width (ft):</b> 14	
<b>Service Life:</b> Long Term		<b>Design Vehicle:</b> Logging Truck	<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D		<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>		<b>Operational:</b> 2	<b>Objective:</b> Storage

**Intended Purpose:** This road provides forest management access. It will be not be needed for timber management within the foreseeable future and will be placed in storage after proposed use is completed.

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

### Travelway Management Strategies

<b>Encourage:</b>	Non-motorized traffic - bicycles, hikers
<b>Accept:</b>	All Terrain Vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	Unauthorized motorized vehicles when in storage.

## RESOURCE PRESCRIPTIONS

### Road: 44905

#### Watershed/Fisheries:

The road crosses one Class I stream.

Timing: Prohibit in stream disturbance from August 15 through May 15.

**Rock Borrow Sites:** The road traverses along the top of a small ridge. There are rock outcrops and bluffs along this ridge.

#### Major Stream Crossings:

Mile Post	0.15
Stream Class	I
Structure	20 foot bridge
Stream Width	8 feet
Stream Depth	< 1 foot
Substrate	Mud
Bank Height	< 3 feet
Fish Habitat	Rearing
Stream Gradient	< 3%



## PLANNED ROAD DESCRIPTIONS

Road Number: 44908	Road Name: Ess	
Termini: 6101 - Sec 7	Entry Cycle: Intermittent	
Length (miles):.2.37	VCU: 487	
Functional Class/Travel Class: Local / 7	Width (ft): 14	
Service Life: Long Term	Design Vehicle: Logging Truck	Critical Vehicle: Logging Truck
Traffic Service Level: D	Highway Safety Act: No	
Maintenance Levels:	Operational: 2	Objective: Storage

**Intended Purpose:** This road provides forest management access. It will be not be needed for timber management within the foreseeable future and will be placed in storage after proposed use is completed.

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

#### Travelway Management Strategies

<b>Encourage:</b>	Non motorized traffic - bicycles, hikers
<b>Accept:</b>	All Terrain Vehicles
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	Unauthorized motorized vehicles when in storage.

# RESOURCE PRESCRIPTIONS

## ROAD: 44908

### Watershed/Fisheries:

The road crosses no muskegs but at mile post 1.05 and 1.60 it skirts around the edges of two.

### Wildlife Biodiversity:

At approximate mile post 1.25 there is a beaver pond complex that is waterfowl nesting habitat.

Timing: Restrict road construction during April 1 through June 30 from mile post 1.05 to mile post 1.75.

### Rock Borrow Sites:

There is an abundance of rock along this route.

### Erosion Control:

There are areas of full bench cut on rock sideslopes that will require end haul. There are several road grade pitches that are near or at the maximum 20% grade. There are several through cuts on rocky hogback ridges.

### Major Stream Crossings:

Mile Post	0.35	1.25	1.70	2.00
Stream Class	II	IV	IV	IV
Structure	48" CMP	2 - 48" CMP	48" CMP	36" CMP
Stream Width	3 feet	6 feet	< 3 feet	< 2 feet
Stream Depth	< 1 foot	< 1 foot	< 1 foot	< 1 foot
Substrate	Mud	Mud	Bedrock	Bedrock
Bank Height	< 2 feet	< 2 feet	< 3 feet	< 3 feet
Fish Habitat	Rearing	N/A	N/A	N/A
Stream Gradient	< 5%	< 3%	> 10%	> 10%

## PLANNED ROAD DESCRIPTIONS

<b>Road Number:</b> 44920		<b>Road Name:</b> Crystal Creek	
<b>Termini:</b> 6256 - Sec. 7		<b>Entry Cycle:</b> Intermittent	
<b>Length (miles):</b> 3.85		<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 7		<b>Width (ft):</b> 14	
<b>Service Life:</b> Long Term		<b>Design Vehicle:</b> Logging Truck	<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D		<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>		<b>Operational:</b> 2	<b>Objective:</b> Storage

**Intended Purpose:** This road provides forest management access. It will not be needed for timber management access within the foreseeable future and will be placed in storage after proposed use is completed.

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

### Travelway Management Strategies

<b>Encourage:</b>	Bicycles, hikers and other non-motorized transportation.
<b>Accept:</b>	Closed to motorized vehicles after timber harvest activities.
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	All motorized traffic.



# RESOURCE PRESCRIPTIONS

## ROAD: 44920

### Watershed/Fisheries:

There are four fish stream crossings: Muddy River, Crystal Creek and Clear Creek and an unnamed stream at mile post 2.80

Timing: Prohibit in stream disturbance from August 15 through June 30 on all four streams.

### Wildlife Biodiversity:

There is a concern about new road access causing increased vulnerability to mountain goats and wolves. All roads will be closed to public motorized vehicular travel during logging and after logging.

### Rock Borrow Sites:

Rock sources are available at mile post 0.40, 0.50 and 1.45.

Mile Post	0.40	0.65	1.15	1.60	2.0
Stream Class	I	IV	I	I	III
Structure	130 Foot Bridge	48" CMP	70 Foot Bridge	20 Foot Bridge	60" CMP
Stream Width	80 feet	3 feet	50 feet	5 feet	5 feet
Stream Depth		< 1 foot	< 1 foot		< 1 foot
Substrate	Bedrock/Cobble	Cobbles	Gravel/Cobble	Cobbles	Cobbles
Bank Height	14 feet	< 1 foot	15 feet	< 5 feet	< 5 feet
Fish Habitat	Spawning	N/A	Spawning	Rearing	N/A
Stream Gradient	5%	< 10%	< 4%	< 5%	> 15%

Mile Post	2.80	2.95	3.05	3.65
Stream Class	II	III	III	III
Structure	60" CMP	60" CMP	72" CMP	20 Foot Bridge
Stream Width	5 feet	5 feet	6 feet	7 feet
Stream Depth	< 1 foot	< 1 foot	< 1 foot	< 1 foot
Substrate	Cobbles	Cobbles	Cobbles	Cobbles
Bank Height	> 5 feet	> 5 feet	> 5 feet	> 10 feet
Fish Habitat	N/A	N/A	N/A	N/A
Stream Gradient	> 10%	> 10%	> 10%	> 10%

## PLANNED ROAD DESCRIPTIONS

Road Number: 44921	Road Name: Clear Creek	
Termini: 44920 - Sec 25	Entry Cycle: Intermittent	
Length (miles): 1.75	VCU: 487	
Functional Class/Travel Class: Local / 7	Width (ft): 14	
Service Life: Long Term	Design Vehicle: Logging Truck	Critical Vehicle: Logging Truck
	Highway Safety Act: No	
Traffic Service Level: D		
Maintenance Levels:	Operational: 2	Objective: Storage

**Intended Purpose:** This road provides forest management access. It will not be needed for timber management within the foreseeable future will be placed in storage after proposed use is completed.

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

### Travelway Management Strategies

<b>Encourage:</b>	Non-motorized vehicles - bicycles, hikers
<b>Accept:</b>	N/A
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	All motorized vehicles.

## RESOURCE PRESCRIPTIONS

### ROAD: 44921

#### **Watershed/Fisheries:**

There are two Class III streams that feed directly into Class I streams. Road construction sediment is a concern.

Timing: Prohibit in stream disturbance from August 15 through June 30 on these two streams.

#### **Wildlife Biodiversity:**

There is a concern about new road access causing increased vulnerability to mountain goats and wolves. All roads will be closed to public motorized vehicular travel during logging and after logging.

#### **Rock Borrow Sites:**

A rock source is available at mile post 0.40, 1.25

#### **Major Stream Crossings:**

Mile Post	0.5
Stream Class	III
Structure	30 foot bridge
Stream Width	7 feet
Stream Depth	< 2 foot
Substrate	Gravel & Cobbles
Bank Height	< 4 feet
Fish Habitat	N/A
Stream Gradient	4%



## PLANNED ROAD DESCRIPTIONS

<b>Road Number:</b> 44990	<b>Road Name:</b> Camp Two	
<b>Termini:</b> 6256 - Section 8		<b>Entry Cycle:</b> Intermittent
<b>Length (miles):</b> 1.36	<b>VCU:</b> 487	
<b>Functional Class/Travel Class:</b> Local / 7		<b>Width (ft):</b> 14
<b>Service Life:</b> Long Term	<b>Design Vehicle:</b> Logging Truck	<b>Critical Vehicle:</b> Logging Truck
<b>Traffic Service Level:</b> D	<b>Highway Safety Act:</b> No	
<b>Maintenance Levels:</b>	<b>Operational:</b> 2	<b>Objective:</b> Storage

**Intended Purpose:** This road provides forest management access.

### Travelway Management Prescription

This road will be designed as a single lane with some turnouts. The surface is maintained to protect the environment and investment.

### Travelway Management Strategies

<b>Encourage:</b>	Non-motorized traffic - bicycles, hikers
<b>Accept:</b>	N/A
<b>Discourage:</b>	N/A
<b>Prohibit:</b>	Public traffic during commercial use.
<b>Eliminate:</b>	Unauthorized motorized vehicles when in storage.

## RESOURCE PRESCRIPTIONS

### ROAD: 44990

#### Watershed/Fisheries:

There are two Class II streams that feed directly into Muddy River. Road construction sediment is a concern.

Timing: Prohibit in stream disturbance from August 15 through June 30 on these two streams.

#### Rock Borrow Sites:

Rock is available on the south side of Muddy River.

Mile Post	0.40	0.65	1.00	1.20
Stream Class	I - Muddy River	II	II	IV
Structure	100 Foot Bridge	60" CMP	60" CMP	48" CMP
Stream Width	75 feet	4 feet	4 feet	3 feet
Stream Depth	< 5 feet	< 1 foot	< 1 foot	< 1 foot
Substrate	Boulders/Cobbles	Cobbles	Cobbles	Bedrock
Bank Height	< 10 feet	8 feet	7 feet	7 feet
Fish Habitat	Spawning/Rearing	N/A	N/A	N/A
Stream Gradient	5%	> 10%	> 10%	> 15%

# Recreation Card

The proposed project would include the construction of an access trail from Forest Development Road 6101 to Ess Lake, construction of a shelter along the lake shore and the placement of a rowboat at or near the shelter site.

The site is on the northeast side of the lake and is well suited for a shelter. The area is well-drained and would get plenty of summer sun. The Regional standard design for a three-sided shelter would be used. A three-sided, log shelter would fit into the surroundings and be compatible with the Roaded Modified Recreation Opportunity Class.

The logical material for tread construction would be gravel. A base layer of log corduroy may be needed in a few very poorly drained areas.

The proposed site will be surveyed for Threatened, Endangered, and Sensitive (TES) plant and animal species before implementation.

## Resource Concerns

**Scenery** - None of the proposed harvest units should be visible from the shelter site. Unit 14 is on the opposite side of the ridge. The Ess Lake Shelter and immediate surroundings are not intended to be identified as a Visual Priority Route or Use Area. Scenery viewed from this location would continue to be managed according to the guidelines outlined in the Forest Plan Scenic Viewshed Land Use Designation.

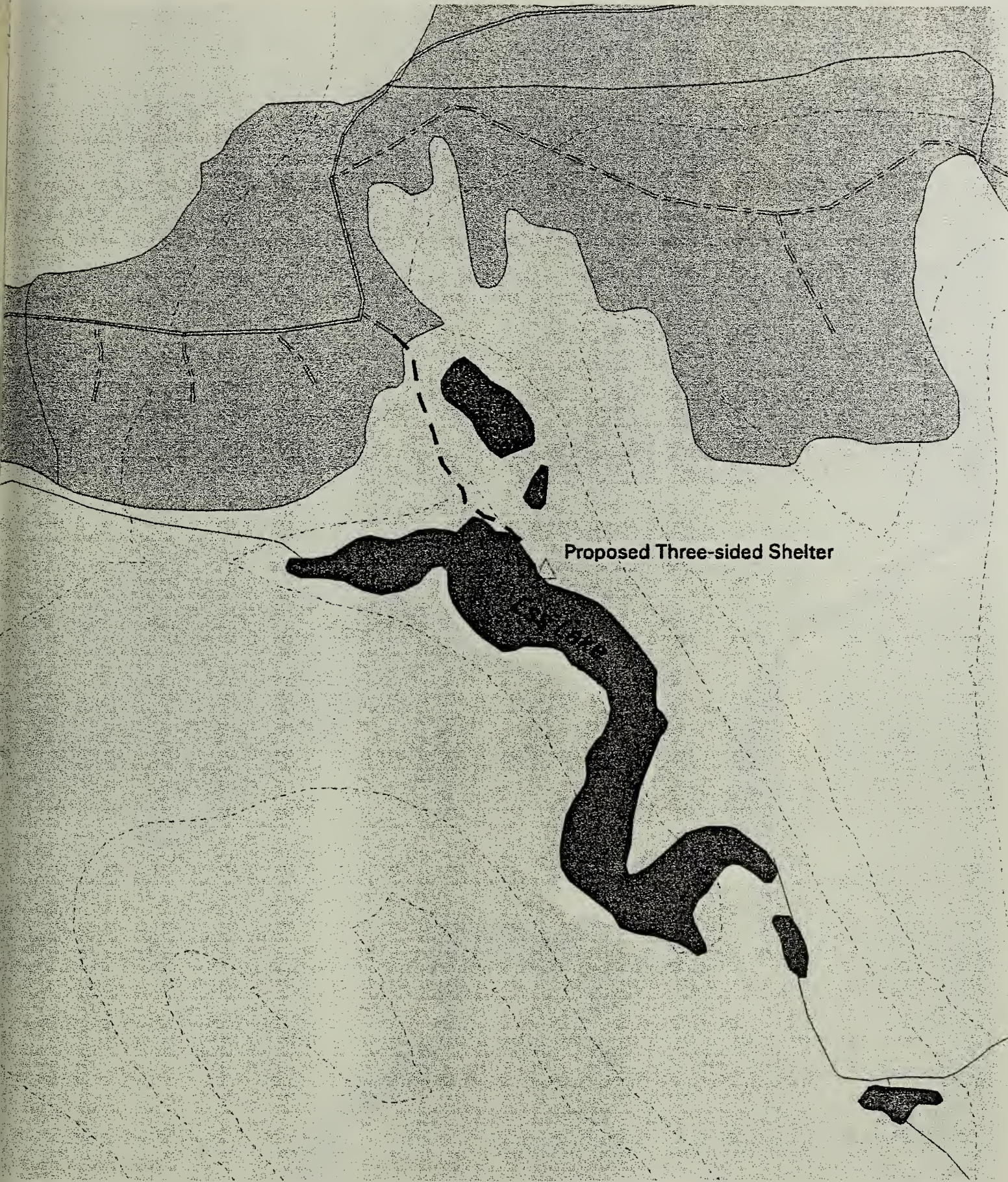
**Wildlife** - No TES wildlife species have been observed in the area. Further site specific surveys will be conducted prior to implementation.

**Cultural Resources** - A cultural resources survey was completed and no cultural remains were identified.

**Sensitive Plants** - No sensitive plants have been found in the area.

**Fisheries** - There were no fisheries concerns with this proposal.





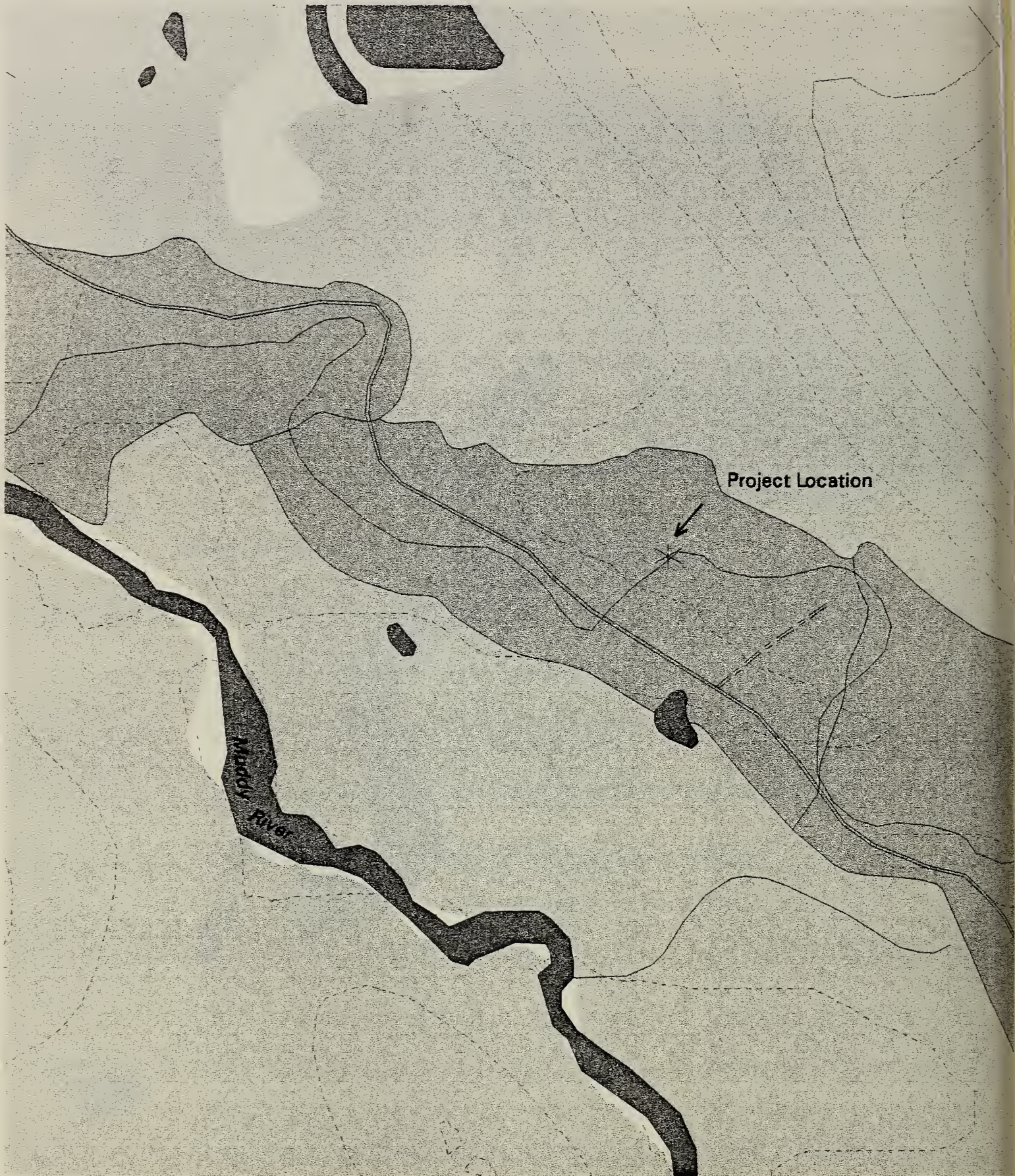
- Forested
- Managed Stands
- Freshwater
- Non-NF Lands
- Streams
- Highways
- All Vehicle Roads
- High Clearance Roads
- Closed Roads

- Closed Non-System Roads
- Non-NF Roads
- Contour Interval: 100 ft
- Surfaced Trail
- Three-Sided Shelter

0 660 1320  
  
 Scale is 1 inch = 660 feet

## Proposed Ess Lake Recreation Site

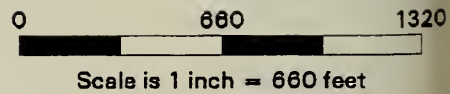




- Forested
- Managed Stands
- Freshwater
- Non-NF Lands
- Streams
- Highways
- All Vehicle Roads
- High Clearance Roads
- Closed Roads

- Closed Non-System Roads
- Non-NF Roads
- Contour Interval: 100 ft

## Proposed Wetland Rehabilitation Project





# Wetland Card

**Concern:** This stream associated wetland has decreased in size following removal of a beaver dam.

**Mitigation:** A log step will be constructed across the channel to reestablish a higher water level.





# **Appendix C**

## **Log Transfer Facility Description**

# Appendix C

Log 1 (x-axis) = Family  
Dissolution



THOMAS BAY LOG TRANSFER FACILITY

FACILITY RECONSTRUCTION ALTERNATIVES

Prepared by: Kenneth H. Elmore Date: 4/2/97

Reviewed by: Henry D. Dyer Date: 4/3/97  
Forest Engineer

The current facility at Thomas Bay for transferring logs from land to water consists of two native log bulkheads, an upland working/log storage pad, and the remains of a native log "beaver" slide. The layout of the existing facility is shown on Exhibit 1 of this analysis. The two native log bulkheads are approximately 30 to 35 years old, and are in a deteriorated condition. Under terms of an active Special Use Permit, a private gravel concession is presently being operated over the larger of the two existing bulkheads, which is the structure closest to deep water. The existing facility is adjacent to the terminal "alluvial fan" at the mouth of Patterson River, which drains into the southern arm of Thomas Bay from the mainland coastal mountains. The existing Forest Service facilities are the only facilities presently in Thomas Bay which provide access to both the State lands and the Forest Service land adjacent to Thomas Bay. The Thomas Bay area is a popular recreation and moose hunting area, and continued access to the uplands is considered important.

The proposed changes to the Thomas Bay transfer facility considered by this analysis include the following alternatives:

1. Construction of an Administrative-use small-boat/seaplane float, using either a floating walkway or a gangway to access float, and construction of a 12% sloped low angle ramp with steel pipe skid system to replace the southern log bulkhead (bulkhead closest to the head of the bay), with the current gravel operation left undisturbed on the northern bulkhead for the present (that bulkhead will need to be reconstructed also at some time in the future). See attached Alternatives 1 and 1A.
2. Construction of a new barge-capable facility immediately to the north of the bulkhead being used by the existing gravel operation, with upland storage/working area developed on the bench at elevation +56 behind the existing developed area and a 100' x 125' working pad at elevation +30, plus an administrative-use small boat/seaplane float located at the current location of the southern existing bulkhead. Gravel operator would relocate to "new" facility at end of Crystal Timber Sale, and the vacated bulkhead would be replaced with a 12% low angle ramp with steel pipe skid system for future small sales and equipment access. See attached Alternative 2.
3. Construction of a new barge-capable facility immediately to the north of the existing gravel operation with upland storage/working area developed on the bench at elevation +56 behind the existing developed area but no working pad at elevation +30, plus an administrative-use seaplane/small boat float located at the current location of the southern existing bulkhead. The current gravel operation would be moved at end of Crystal Timber Sale to the "new" facility, and the vacated bulkhead replaced with a new bulkhead for equipment access and future small-sale operations using either a crane/yarder or a floating LTF slide system to water logs. See attached Alternative 3.

Other upland working/storage area layouts were explored, but eliminated from further consideration due to excessive excavation volumes. All alternatives proposed above include raising the grade of the existing developed working area to elevations shown on the attached alternatives and installation of drainage and settlement systems to meet NPDES requirements for discharge of surface



ELL SPECIAL  
SE PERMIT  
BOUNDARY

POSED  
ADMIN  
BUILDING  
LOCATION

20' x 25' FLOAT WITH  
5' x 100' FLOATING  
SEGMENTED WALKWAY

12' ACCESS  
ROAD/RAIL

EXISTING BULKHEAD TO BE  
REBUILT IN FUTURE

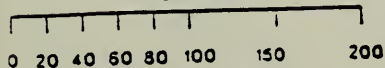
RAISE WORKING AREA TO +26  
GRADE WITH NPDES DRAINAGE

REMOVE EXISTING SLIDE AND  
BULKHEAD

12% SHOT-ROCK LTF  
RAMP FROM -4 TO +30

# SITE PLAN

SCALE:



BASIS OF ELEVATION:  
U.S.C. & G.S. CAP  
THOMAS BAY (SPRAY ISLAND)

HIGHEST HIGH WATER:	20.0 FEET (+/- 0.5 FT)
MEAN HIGHER HIGH WATER:	15.4 FEET
MEAN HIGH WATER:	14.5 FEET
MEAN TIDE LEVEL:	8.0 FEET
MEAN LOW WATER:	1.5 FEET
MEAN LOWER LOW WATER:	0.0 FEET
LOWEST LOW WATER:	-5.0 FEET (+/- 0.5 FT)



BELL SPECIAL  
USE PERMIT  
BOUNDARY

20' x 25' FLOAT WITH  
5' x 65' GANGWAY AND  
10' HIGH BULKHEAD

PROPOSED  
NEW ADMIN  
BUILDING  
LOCATION

12' ACCESS  
ROAD/TRAIL

EXISTING BULKHEAD TO BE  
REBUILT IN FUTURE

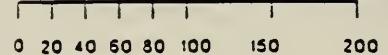
RAISE WORKING AREA TO +26  
GRADE WITH NPDES DRAINAGE

REMOVE EXISTING SLIDE AND  
BULKHEAD

12% SHOT-ROCK LTF  
RAMP FROM -4 TO +30

# SITE PLAN

SCALE:



BASIS OF ELEVATION:  
U.S.C. & G.S. CAP

"THOMAS BAY" (SPRAY ISLAND)

HIGHEST HIGH WATER:	20.0 FEET (-/-0.5 FT)
MEAN HIGHER HIGH WATER:	15.4 FEET
MEAN HIGH WATER:	14.5 FEET
MEAN TIDE LEVEL:	8.0 FEET
MEAN LOW WATER:	1.5 FEET
MEAN LOWER LOW WATER:	0.0 FEET
LOWEST LOW WATER:	-5.0 FEET (-/-0.5 FT)



BELL SPECIAL  
USE PERMIT  
BOUNDARY

CONSTRUCT 30' x 200' BARGE-  
CARABLE PLATFORM/BULKHEAD

CONSTRUCT 10% GRADIENT ROADWAY  
AND WORKING PAD AT ELEV. +30

CONSTRUCT  
WORKING &  
STORAGE  
PAD @ +56

REMOVE EXISTING BULKHEAD  
IN FUTURE, CONSTRUCT 12%  
RAMP W/ CURVED ALIGNMENT

REMOVE EXISTING SLIDE  
AND BULKHEAD

CONSTRUCT 20' x 25'  
FLAT AND 5' x 120'  
FLOATING SEGMENTED  
WALKWAY

RAISE EXISTING WORK  
AREA TO +30 WITH  
NPDES DRAINAGE

RECONSTRUCT  
ACCESS ROAD

## SITE PLAN

SCALE:

0 20 40 60 80 100 150 200

BASIS OF ELEVATION:  
U.S.C. & G.S. CAP

"THOMAS BAY" (SPRAY ISLAND)

HIGHEST HIGH WATER: 20.0 FEET (-/- 0.5 FT)  
MEAN HIGHER HIGH WATER: 15.4 FEET  
MEAN HIGH WATER: 14.5 FEET  
MEAN TIDE LEVEL: 8.0 FEET  
MEAN LOW WATER: 1.5 FEET  
MEAN LOWER LOW WATER: 0.0 FEET  
LOWEST LOW WATER: -5.0 FEET (-/- 0.5 FT)

C - 5

THOMAS BAY LTF  
ALTERNATIVE 2

DRAWN BY: K. ELMORE DATE: 3/31/97



BELL SPECIAL  
USE PERMIT  
BOUNDARY

CONSTRUCT 30' x 200' BARGE-  
CARABLE PLATFORM/BULKHEAD

CONSTRUCT 10% GRADIENT ROADWAY

ADJ. EASEMENT 10/1/18

RECONSTRUCT BULKHEAD  
IN FUTURE FOR USE WITH  
FLOATING LTF OR BARGE

REMOVE EXISTING SLIDE  
AND BULKHEAD

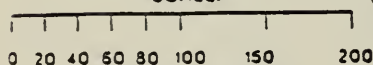
CONSTRUCT 20' x 25'  
FLOAT AND 5' x 120'  
FLOATING SEGMENTED  
WALKWAY

RAISE EXISTING WORK  
AREA TO +30 WITH  
NPDES DRAINAGE

CONSTRUCT  
WORKING &  
STORAGE  
PAD @ +56

# SITE PLAN

SCALE:



BASIS OF ELEVATION:  
U.S.C. & G.S. CAP

"THOMAS BAY" (SPRAY ISLAND)

RECONSTRUCT  
ACCESS ROAD

THOMAS BAY LTF  
ALTERNATIVE 3

DRAWN BY: K. ELMORE DATE: 3/31/97

HIGHEST HIGH WATER:	20.0 FEET (+/- 0.5 FT)
MEAN HIGHER HIGH WATER:	15.4 FEET
MEAN HIGH WATER:	14.5 FEET
MEAN TIDE LEVEL:	8.0 FEET
MEAN LOW WATER:	1.5 FEET
MEAN LOWER LOW WATER:	0.0 FEET
LOWEST LOW WATER:	-5.0 FEET (+/- 0.5 FT)



water runoff. Drainage for NPDES requirements would also be incorporated into the design of any new upland working/storage areas.

Projected costs for the various alternatives being considered in this analysis are as follows:

Alternative:	Alternative 1	Alternative 1A	Alternative 2	Alternative 3
	12½ Ramp and Floating Walk to Float	12½ Ramp and Bulkhead/Gangway to Float	Barge-Capable Facility with 2 upland pads, Floating Walk to Float, with future ramp	Barge-Capable Facility with 1 upland pad, Floating walk to Float, with future bulkhead
Work Item				
Excavation and Embankment:	10,315 CY @ \$ 6.00/CY	10,878 CY @ \$ 6.00/CY	27,261 CY @ \$ 5.00/CY	17,000 CY @ \$ 5.00/CY
(Cut @ \$5.00/CY; Fill @ \$6.00/CY)	\$ 61,890	\$ 65,268	\$136,305	\$ 85,000
Ramp Skid System:	\$ 56,000	\$ 56,000	\$ 56,000*	N/A
Float/Walkway:				
Floating Access:	\$ 90,000	N/A	\$ 90,000	\$ 90,000
Gangway Access:	N/A	\$ 80,000	N/A	N/A
Barge-Capable Structure with 2 dolphins	N/A	N/A	\$619,000	\$586,000
Future Development:				
Second Bulkhead:	\$237,000*	\$237,000*	N/A	\$237,000*
Low-Angle Ramp:	N/A	N/A	\$ 30,000*	N/A
Development Costs for present time:	\$207,890	\$201,268	\$845,305	\$761,000
Development Costs in future (items marked by *)	\$237,000*	\$237,000*	\$ 86,000*	\$237,000*

There are several non-economic factors which must also be considered in the selection of the final alternative for implementation. These are:

1. All administrative float alternatives presented will not provide fully accessible access meeting ADAAG requirements. The slope of the beach at this site is steeper than ADAAG criteria, averaging 12 to 25%. Use of a floating segmented walkway to access the small boat/seaplane float would be limited to the prevailing beach slopes. Tidal fluctuation at the site can be as much as 25 feet. Use of conventional gangways for access from the float to the beach will yield maximum slopes of 30% to 36% at low tide. It is recommended that the Environmental Impact Statement for this development discuss the issue of accessibility for administrative and/or public traffic, and whether ADAAG accessibility requirements are appropriate for this site.

2. The low-angle ramp in Alternatives 1 and 1A is immediately adjacent to the southern end dolphin installed by the Special-Use Permittee presently loading gravel over the northern bulkhead at the site. This dolphin will be in the way of log watering operations on lower tides, if the ramp is built on the proposed alignment. The proposed alignment was selected to minimize disturbance of presently undisturbed intertidal habitat, and to reduce encroachment on the upland pad traveled way. Since the dolphin in question is outside the boundary of the special-use permit, there are 2 solutions to the log-watering concern: realignment of the ramp (thus impacting a larger intertidal area), or requiring the special-use permit operator to work within the boundaries of his permit (by relocating the dolphin in question).
3. Both Alternative 1 and Alternative 1A will require logs to be placed into the water for transfer. Neither of these alternatives provide for transfer of logs without placing bark in the water. If permitting agencies require logs to be transferred without placing bark in the water in the future, future construction of a barge-capable facility would be required to continue log transfer operations at this facility.
4. Location of the administrative-use float in both Alternative 1 and Alternative 1A is adjacent to the existing special-use permit gravel operations. As such, the float has had to be located so it is clear of the barge access to the gravel operation. As a result, the float will go dry on tides lower than +1.0 feet (similar to the float at the Portage Bay LTF). Boats tied to the float will also go dry. Both boat and airplane access to this float would be restricted during times when the gravel barge is tied up for loading, particularly if the barge loading operation is relocated to be within the special use permit boundaries for the operation.
5. Alternatives 1 and 1A provide an opportunity to relocate the existing USFS Administration building at the site of the old "ADF&G" cabin. This would place the Administration cabin on the bench above the proposed location of the administrative float, away from the heavy truck haul traffic.



# **Appendix D**

## **Management Prescriptions**





# TIMBER PRODUCTION

## Land Use Designation TM

### Goals

To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs.

To manage these lands for sustained long-term timber yields.

To seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this Land Use Designation.

### Objectives

Within this Land Use Designation, apply the Visual Quality Objectives of Modification in the foreground distance zone as seen from Visual Priority Travel Routes and Use Areas (see Appendix F). Apply the Maximum Modification VQO to all other areas.

Locate and design timber harvest activities primarily to meet timber objectives. Suitable forest lands are available for timber harvest; appropriate silvicultural systems may be used. Other timber management objectives include:

- ♦ seek to reduce clearcutting when other cutting methods will meet land management objectives;
- ♦ identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production);
- ♦ use forest health management to protect resource values;
- ♦ improve timber growth and productivity on commercial forest lands;
- ♦ plan, inventory, prepare, offer, sell and administer timber sales and permits to ensure the orderly development of timber production;
- ♦ emphasize the overall reduction of costs, increase of revenues, and improvement of public service within the timber program.

Provide a spectrum of recreation and tourism opportunities consistent with the capabilities of this Land Use Designation. Manage recreation and tourism use to be compatible with timber production objectives. Manage changed recreation settings in accordance with the appropriate Recreation Opportunity Spectrum class.

Plan a transportation network of roads and helicopter access that will eventually access most of the suitable timber lands for standard logging or helicopter yarding systems.

### Desired Condition

Suitable timber lands are managed for the production of sawtimber and other wood products on an even-flow, Long-term Sustained Yield basis; the timber yield produced contributes to a Forest-wide sustained yield. An extensive road system provides access for timber management activities, recreation uses, hunting and fishing, and other public and administrative uses; some roads may be closed, either seasonally or year-long, to address resource concerns. Management activities will generally dominate most seen areas. Tree stands are healthy and in a balanced mix of age classes from young stands to trees of harvestable age, often in 40- to 100-acre stands. Recreation opportunities, associated with roaded settings from Semi-primitive to Roaded Modified, are available. A variety of wildlife habitats, predominantly in the early and middle successional stages, are present.



# Management Prescriptions

## Timber production Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP	All	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS	All	4-74
Soil And Water	S&W	All	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM	All	4-93
Trails	TRAI	All	4-100
Transportation	TRAN	All	4-102
Wetlands	WET	All	4-109
Wildlife	WILD	All	4-110



## Apply the following Land Use Designation and Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Permanent administrative facilities are constructed to be compatible with this Land Use Designation objective.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression option identified in the Southeast Alaska/Prince William Sound Fire Management Plan. An Escaped Fire Situation Analysis (EFSA) of expected fire behavior, time of year, and locations with respect to private land and adjacent land use areas, may lead to a lower strategy. If an EFSA discloses no adverse effects and it is more cost-efficient, the lower strategy will be used.
- B. Suppression tactics are limited only by the standards and guidelines for the Land Use Designation, such as soil and water.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Management-ignited prescribed fire may be used for fuels management, insect and disease protection, silvicultural site preparation, and wildlife habitat improvement.
- B. Do not use prescribed natural fire.

### FOREST HEALTH

#### Forest health Management: HEALTH1

- A. Forest insect and disease management activities emphasize forest health through manipulating insects and diseases to desirable levels.
  - 1. Encourage Timber Stand Improvement, sanitation, and salvage.
  - 2. Evaluate chemical, cultural, mechanical, biological and "no action" to manipulate insects and diseases to desirable levels.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Inventory*

- A. Provide heritage resource assistance to all development proposals. Coordination includes participation and support for environmental analysis, inventory, evaluation, assessment, monitoring and protection of Heritage Resources during activities.
  - 1. Heritage Resource inventory will be accomplished during project planning. SHPO concurrence and Forest Supervisor approval is required prior to implementation.
  - 2. Heritage resource specialists shall provide input on known or predicted heritage resource site density in proposed project areas and make recommendations to manage Heritage Resources.
  - 3. Should any Heritage Resources be discovered during project activity, all work within the vicinity of the discovery shall cease until a heritage resource specialist is able to evaluate the situation and resumption of activity is approved by the Forest Supervisor.

# Management Prescriptions

## KARST AND CAVES Cave Management Program: CAVE

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this LUD.

## LANDS

### Special Use Administration (Non-Recreation): LAND122

- A. Authorize only those uses which are compatible with Land Use Designation objectives. Avoid issuing, or limit the duration of, permits for uses which require natural surroundings.
- B. This Land Use Designation represents a Transportation and Utility Systems (TUS) "Window" and provides opportunities for the future designation and location of transportation and utility sites or corridors.

### Landline Location and Maintenance: LAND231, LAND24

- A. Provide adequate landline marking for Forest Service contractors.
  - 1. Prior to Forest Service management activities, survey, mark, and post the boundary of National Forest System lands, to Forest Service standards, where there is a risk of trespass.

## MINERALS AND GEOLOGY

### Minerals and Geology Resource Preparation: MG11

#### *Resource Preparation*

- A. Coordinate the location of timber and mining transportation systems when feasible.
- B. Coordinate with claimant to ensure the location of timber sale units and roads across mining claims do not interfere with mining activities, markers, and improvements.

### Minerals and Geology Administration: MG12

#### *Forest Lands Open to Mineral entry*

- A. Forest lands within this Land Use Designation are open to mineral entry.
- B. Assure prospectors and claimants their right of ingress and egress granted under the General Mining Law of 1872, ANILCA, and Forest Service Mining Regulations 36 CFR 228.
- C. Permit reasonable access to mining claims in accordance with the provisions of an approved Plan of operations.

#### *Plan of operations*

- A. Work with claimant to develop a Plan of operations that is compatible with the emphasis of this Land Use Designation. Include mitigation measures that are compatible with the scale of proposed development and commensurate with potential resource impacts. Apply the following management practices to reduce resource impacts.
  - 1. Manage mineral activities to maintain the present and continued productivity of anadromous fish and other foodfish habitat to the maximum extent feasible. (Consult ANILCA, Section 505 (a).)
  - 2. Apply appropriate Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads.
  - 3. Take advantage of topographic and vegetative screening when locating drill rigs and pumps, roads, rock quarries, structures, and marine transfer facilities.
  - 4. Ensure that disturbed area are revegetated in accordance with project plans.
  - 5. Approve reclamation plans in which minerals activities leave a natural-appearing condition.



## RECREATION AND TOURISM

### Recreation Use Administration: REC122

#### *Recreation Settings*

- A. Provide a spectrum of outdoor recreation and tourism opportunities consistent with the objectives of this Land Use Designation.
  - 1. Manage for the existing recreation settings and opportunities until approved activities change the ROS setting(s). Manage recreation and tourism use in a manner that is compatible with the timber harvest objectives.
  - 2. In locations where approved activities change the recreation setting(s), manage the new setting(s) with the appropriate ROS guidelines (generally Roaded Modified).
  - 3. Seek to maintain the recreation opportunity along existing trail corridors by minimizing road crossings and clearing directly adjacent to the trail.
  - 4. Seek to minimize impacts to inventoried Recreation places and to developed recreation and tourism facilities (such as cabins and campgrounds) through scheduling and location of project activities.

#### *Recreation Special Uses*

- A. Major and minor developments may be compatible with the LUD objectives depending on the scope, purpose, and magnitude of the proposal. Proposals will be evaluated on a case-by-case basis. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

## SCENERY

### Scenery Operations: VIS1

- A. Timber management activities may dominate the visual character of the landscape.
  - 1. Apply Forest-wide Standards & Guidelines for the Modification VQO in the foreground distance zone of Visual Priority Travel Routes and Use Areas (see Appendix F) and the Maximum Modification Visual Quality Objective for all other areas. This objective defines the maximum limit of allowable change to the visual character of the area; less visible evidence of activities is acceptable.
  - 2. Consider roadside clean up as a mitigation measure when recreational use is included as a road management objective for the proposed road.
  - 3. In areas visible from Visual Priority Travel Routes and Use Areas, incorporate landscape design techniques in the planning process to the extent that they are compatible with LUD objectives.

## SOIL AND WATER

### Watershed Resource Planning: S&W112

- A. Delineate the location of high hazard soils, riparian, and other sensitive areas on project maps to insure their recognition, proper consideration, and protection on the sale area.
- B. Manage non-designated domestic water use watersheds for multiple use while providing water suitable for human consumption under of State Water Quality Standards and water supply regulations.
- C. Apply Best Management Practices (BMP's) to all land-disturbing activities as a process to protect the beneficial uses of water from non-point sources of pollution. (Note: Appendix C of this plan includes a summary of Best Management Practices which are found in Chapter 10 of the Soil and Water



# Management Prescriptions

Conservation Handbook, 2502.22). Also consult FSM 2530, Facilities and Transportation Forest-wide Standards & Guidelines, U.S. Army Corps of Engineers Regulations (33 CFR 323.4) and the Clean Water Act.

## **Watershed Resource Improvements: S&W2**

- A. Accomplish soil and water improvement projects on non-designated domestic water use watersheds to prevent degradation of water quality below the State of Alaska's Water Quality Standard for domestic use.

## **TIMBER**

### **Timber Resource Planning: TIM112**

- A. Timber management is emphasized. Suitable forested land is available for harvest and is included in the Allowable Sale Quantity calculation. Tentatively suitable lands assigned to no harvest by standard or guideline are unsuitable and not included in the Allowable Sale Quantity calculation.

### **Timber Resource Coordination: TIM113**

- A. Personal use wood harvesting and Christmas tree cutting activities are fully compatible with this Land Use Designation.

### **Timber Sale Preparation: TIM114**

- A. Locate and design timber harvest activities primarily to meet timber objectives. Include integration of other resources objectives, particularly wildlife and vegetative diversity, if they do not have a significant adverse impact on the timber resource goals. Timber harvest activities may include all applicable silvicultural systems.
- B. The following guidelines provide direction for timber harvest activities to meet Visual Quality Objectives (VQO) and Visual Absorption Capability (VAC) settings. The guidelines define the maximum allowable disturbance for timber harvest. Ground conditions may indicate a need to be more or less restrictive in scheduling harvest to meet the intent of the Visual Quality Objective.
  - 1. Modification - Management activities may dominate the characteristic landscape, yet will be designed to borrow from form and line found in the naturally-occurring landscape.
  - 2. Maximum Modification - This VQO allows management activities to dominate the seen area. In planning timber harvest, design activities to resemble natural occurrences as viewed in the background distance zone.
- C. The following guidelines provide specific visual mitigation measures appropriate to timber management.
  - 1. The ability to attain the adopted Visual Quality Objective is dependent on many variables. Visual Absorption Capacity (VAC) is an estimate of the relative ability of a landscape to absorb management activities. A Low VAC setting generally has steep slopes, with little landscape variety, while a High VAC setting is relatively flat and/or has a high degree of variety in the landscape.
  - 2. The unit sizes listed below provide guidance to the project IDT. Each landscape setting is different and should be evaluated on a case-by-case basis. There may be instances where the visual objective can be attained while the unit size is greater than the guideline, and there also may be instances where the unit must be smaller to meet the intent of the Visual Quality Objective.
  - 3. The following describes typical clearcut regeneration methods and approximate unit sizes for landscapes of different visual absorption capabilities for the VQO's adopted in this LUD.

- VQO Modification:  
 Low: Clearcut (approx. 15 - 40 acres)  
 Intermediate: Clearcut (approx. 40 - 60 acres)  
 High: Clearcut (approx. 60 - 100 acres)
  - VQO Maximum Modification:  
 Low: Clearcut (approx. 50 - 75 acres)  
 Intermediate: Clearcut (approx. 80 - 100 acres)  
 High: Clearcut (approx. 80 - 150 acres)
- D. Consult Timber Forest-wide Standards & Guidelines for maximum sizes of created openings.
  - E. Seek to provide for a reasonable assurance of windfirm boundaries. To design for windfirmness, consider conditions such as soils, local wind patterns, tree height and size, and other site-specific factors.

## TRANSPORTATION      **Transportation Operations: TRAN1**

- A. Develop and manage cost-effective transportation systems which integrate resource requirements consistent with Land Use Designation direction.
  - 1. Perform integrated logging system and transportation system analysis to determine the least-cost facility (considering cost of construction, maintenance, and hauling) and design standards necessary to meet Land Use Designation objectives.
  - 2. If the need to restrict access is identified during project interdisciplinary review, roads may be closed, either seasonally or yearlong. (See Transportation Forest-wide Standards & Guidelines.)
  - 3. Consider future recreational access in location and design of roads.
  - 4. Seek to avoid road crossings on existing trails or locating roads parallel to trails. Should no other feasible alternative exist, minimize site disturbance visible from the trail. Locate rock source developments away from trails to the extent possible, while meeting the objectives of this Land Use Designation.

## WILDLIFE                      **Wildlife Habitat Planning: WILD112**

- A. Use existing inventories and evaluate the need for further project-specific inventories of wildlife habitat conditions during project analysis.
  - 1. Select Management Indicator Species (MIS) appropriate to the project area for project analysis. (See Wildlife Forest-wide Standards & Guidelines.)
- B. Consider wildlife habitat needs during project planning and implementation.
  - 1. Use the habitat needs of MIS to evaluate opportunities for, and consequences on, wildlife.



# MODIFIED LANDSCAPE

## Land Use Designation ML

### Goals

To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground distance zone.

To recognize the scenic values of suitable timber lands viewed from identified popular roads, trails, marine travel routes, recreation sites, bays, and anchorages, and to modify timber harvest practices accordingly.

To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood products to meet society's needs.

To seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this Land Use Designation.

### Objectives

Within this Land Use Designation, apply the Visual Quality Objectives of Partial Retention, in the foreground distance zone, and Modification, in the middleground and background distance zones, as seen from the Visual Priority Travel Routes and Use Areas (see Appendix F). Apply the Maximum Modification VQO to all other areas.

Suitable forest lands are available for timber harvest. Utilize appropriate silvicultural systems consistent with the adopted VQO's. Other timber management considerations include:

- ♦ seek to reduce clearcutting when other methods will meet land management objectives;
- ♦ identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production);
- ♦ use forest health management to protect resource values;
- ♦ improve timber growth and productivity on commercial forest lands;
- ♦ plan, inventory, prepare, offer, sell, and administer timber sales and permits to ensure the orderly development of timber production;
- ♦ emphasize the overall reduction of costs, increase of revenues, and improvement of public service within the timber program.

Provide a spectrum of recreation and tourism opportunities consistent with the capabilities of this Land Use Designation. Semi-primitive to roaded experiences may be offered. Avoid changes to semi-primitive non-motorized settings when feasible.

Design roads and associated rock quarries to meet the applicable Visual Quality Objective.

### Desired Condition

In areas managed under the Modified Landscape Land Use Designation, forest visitors, recreationists, and others using popular travel routes and use areas will view a somewhat modified landscape. Management activities in the visual foreground will be subordinate to the characteristic landscape, but may dominate the landscape in the middle and backgrounds. Within the foreground, timber harvest units are typically small and affect only a small percentage of the seen area at any one point in time. Roads, facilities, and other structures are also subordinate to the foreground landscape. Recreation opportunities associated with natural-appearing to modified settings are available. A variety of successional stages provide a range of wildlife habitat conditions. A yield of timber is produced which contributes to Forest-wide sustained yield.



# Management Prescriptions

## Modified Landscape Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP	All	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS	All	4-74
Soil And Water	S&W	All	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM	All	4-93
Trails	TRAI	All	4-100
Transportation	TRAN	All	4-102
Wetlands	WET	All	4-109
Wildlife	WILD	All	4-110

## Apply the following Land Use Designation Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Locate and construct facilities for administrative use that meet the Visual Quality Objective.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression option identified in the Southeast Alaska/Prince William Sound Fire Management Plan. An Escaped Fire Situation Analysis (EFSA) of expected fire behavior, time of year, and locations with respect to private land and adjacent land use areas, may lead to a lower strategy. If an EFSA discloses no adverse effects and it is more cost-efficient, the lower strategy will be used.
- B. Suppression tactics are limited only by the standards and guidelines for this Land Use Designation, such as soil, water quality, and visual quality.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Management-ignited prescribed fire must meet the Partial Retention VQO and meet all soil and water quality standards and guidelines.
  1. Treat all activity fuels to meet the Partial Retention VQO within one year following timber harvest.
- B. Do not use prescribed natural fire.

### FOREST HEALTH

#### Forest Health Management: HEALTH1

- A. Forest insect and disease management activities emphasize forest health through achieving beneficial populations of insects and diseases.
  1. Encourage Timber Stand Improvement, sanitation, and salvage.
  2. Manipulate insects and diseases to desirable levels by evaluating chemical, cultural, mechanical, biological or "no action" alternatives.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Inventory*

- A. Provide heritage resource assistance to all developmental proposals. Coordination includes participation and support for environmental analysis, inventory, evaluation, assessment, monitoring and protection of Heritage Resources during activities.
  1. Heritage Resource inventory will be accomplished during project planning. SHPO concurrence and Forest Supervisor approval is required prior to implementation.
  2. Heritage Resource Specialists shall provide input on known or predicted heritage resource site density in proposed project areas and make recommendations to manage Heritage Resources.
  3. Should any Heritage Resources be discovered during project activity, all work within the vicinity of the discovery shall cease until a heritage resource specialist is able to evaluate the situation and resumption of activity is approved by the Forest Supervisor.



# Management Prescriptions

- B. Identify opportunities for interpretation of Heritage Resources for public education and enjoyment.

## **KARST AND CAVES      Cave Management Program: CAVE**

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this LUD.

## **LANDS**

### **Special Use Administration (Non-Recreation): LAND122**

- A. Authorize only those development activities compatible with LUD objectives. Avoid issuing, or limit the duration of, permits for uses which require natural surroundings.
  - 1. Permit only activities which can be designed to meet the Visual Quality Objectives for this LUD.
- B. This Land Use Designation represents a Transportation and Utility Systems (TUS) "Window" and provides opportunities for the future designation and location of transportation and utility sites or corridors.

### **Landline Location and Maintenance: LAND231, LAND24**

- A. Provide adequate landline marking for Forest Service contractors.
  - 1. Prior to Forest Service management activities, survey, mark, and post the boundary of National Forest System lands to Forest Service Standards, where there is a risk of trespass.

## **MINERALS AND GEOLOGY**

### **Minerals and Geology Administration: MG12**

#### *Forest Lands Open to Mineral entry*

- A. Forest lands within this Land Use Designation are open to mineral entry.
- B. Assure prospectors and claimants their right of ingress and egress granted under the General Mining Law of 1872, ANILCA, and Forest Service Mining Regulations 36 CFR 228.
- C. Permit reasonable access to mining claims in accordance with the provisions of an approved Plan of operations.

#### *Plan of operations*

- A. Encourage use of state-of-the art techniques for developing minerals, to reduce impacts to the extent reasonable. Include mitigation measures that are compatible with the scale of proposed development and commensurate with potential resource impacts.
- B. Apply Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads.
- C. Manage mineral exploration and development activities to be compatible with the emphasis of this Land Use Designation. Apply the following management practices to reduce resource impacts.
  - 1. Manage mineral management activities to maintain the present and continued productivity of anadromous fish and other foodfish habitat to the maximum extent feasible. (Consult ANILCA, Section 505 (a).)
  - 2. Take advantage of topographic and vegetative screening when locating drill rigs and pumps, roads, rock quarries, structures, and marine transfer facilities.
  - 3. Ensure that vegetation removed from the project area is hauled away, buried, burned, or scattered when such vegetation is located adjacent to Visual Priority Travel Routes and Use Areas.
  - 4. Minimize the scale of spoil/disposal areas in relation to the surrounding landscape as seen from sensitive viewpoints.



5. Approve use of colors that simulate those found in the characteristic landscape.
6. Ensure that disturbed areas are revegetated in accordance with project plans.
7. Apply timing restrictions to minerals activities as needed during critical wildlife mating, calving, and migrating periods.
8. Ensure that landform modifications simulate naturally occurring forms.
9. Approve reclamation plans in which minerals activities leave a natural-appearing condition.

## RECREATION AND TOURISM

### Recreation Use Administration: REC122

#### *Recreation Settings*

- A. Provide a spectrum of outdoor recreation and tourism opportunities consistent with the objectives of the Land Use Designation.
  1. Manage for the existing recreation settings and opportunities until approved activities and practices change the ROS setting(s). Manage recreation and tourism use in a manner that is compatible with the timber harvest objectives.
  2. In locations where approved activities change the recreation setting(s), manage the new setting(s) with the appropriate ROS guidelines (generally Roaded Modified).
  3. Seek to maintain the recreation opportunity along existing trail corridors by minimizing road crossings and clearing directly adjacent to the trail.
  4. Seek to minimize impacts to areas directly adjacent to developed recreation and tourism facilities (such as cabins and campgrounds) through scheduling and location of project activities.
- B. In those areas inventoried as Recreation places, seek to maintain the existing ROS setting. When approved activities nearby may result in a change to the ROS setting, minimize the impacts so they maintain a Roaded Natural or more natural ROS setting.

#### *Recreation Special Uses*

- A. Major and minor developments may be compatible with the LUD objectives depending on the scope, purpose, and magnitude of the proposal. Proposals will be evaluated on a case-by-case basis. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

## SCENERY

### Scenery Operations: VIS1

- A. In foreground settings, design management activities to be subordinate to the characteristic landscape. Management activities may dominate areas seen in the middleground and background distance. In all settings, activities should utilize existing form, line, color, and texture found in the characteristic landscape.
  1. Apply the Partial Retention Visual Quality Objective (VQO) in the foreground distance zone, and the Modification VQO in the middleground and background distance zones, as seen from Visual Priority Travel Routes and Use Areas (see Appendix F). In areas of this allocation not seen from the Visual Priority Travel Routes and Use Areas, apply the Maximum Modification VQO. These objectives define the maximum limit of allowable change to visual character of the area; less visible evidence of activities is acceptable.

# Management Prescriptions

2. Exceptions for small areas of non-conforming developments, such as recreation sites, transportation developments, Log Transfer Facilities and mining development, may be considered on a case-by-case basis.

## SOIL AND WATER

### Watershed Resource Planning: S&W112

- A. Delineate the location of high hazard soils, riparian, and other sensitive areas on project maps to insure their recognition, proper consideration, and protection on the sale area.
- B. Manage non-designated domestic water use watersheds for multiple use, while providing water suitable for human consumption under of State Water Quality Standards and water supply regulations.
- C. Apply Best Management Practices (BMP's) to all land-disturbing activities as a process to protect the beneficial uses of water from non-point sources of pollution. (Appendix C of this plan includes a summary of Best Management Practices which are found in Chapter 10 of the Soil and Water Conservation Handbook, 2502.22). Also consult FSM 2530, Facilities and Transportation Forest-wide Standards & Guidelines, U.S. Army Corps of Engineers Regulations (33 CFR 323.4) and the Clean Water Act.

### Watershed Resource Improvements: S&W2

- A. Accomplish soil and water improvement projects on non-designated domestic water use watersheds to prevent degradation of water quality below the State of Alaska's Water Quality Standard for domestic use.

## TIMBER

### Timber Resource Planning: TIM112

- A. Suitable forested land is available for harvest and is included in the Allowable Sale Quantity calculation. Tentatively suitable lands assigned to no harvest by standard or guideline are unsuitable and not included in the Allowable Sale Quantity calculation.
- B. Personal use wood cutting activities are compatible with this Land Use Designation provided that management objectives are met.

### Timber Sale Preparation: TIM114

- A. Timber harvest activities may include all applicable silvicultural systems. Recognize the effects of color, tone, texture, line, slope, size, and edge on the characteristic landscape.
- B. The following guidelines provide direction for timber harvest activities to meet Visual Quality Objectives (VQO) and Visual Absorption Capability (VAC) settings. The guidelines define the maximum allowable disturbance for timber harvest. Ground conditions may indicate a need to be more or less restrictive in scheduling harvest to meet the intent of the Visual Quality Objective.
  1. Partial Retention - The Partial Retention Visual Quality Objective requires that, although timber harvest activities are evident, they must remain subordinate to the characteristic landscape.
  2. Modification - Management activities may dominate the characteristic landscape, yet will be designed to borrow from form and line found in the naturally-occurring landscape.
  3. Maximum Modification - Activities may visually dominate the original characteristic landscape. This VQO should be met within one year in the foreground distance zone and within five years in the middle and background distance zones.
- C. The following guidelines provide specific visual mitigation measures appropriate to timber management.



1. The ability to attain the adopted Visual Quality Objective is dependent on many variables. Visual Absorption Capacity (VAC) is an estimate of the relative ability of a landscape to absorb management activities. A Low VAC setting generally has steep slopes, with little landscape variety, while a High VAC setting is relatively flat and/or has a high degree of variety in the landscape.
2. The unit sizes listed below provide guidance to the project IDT. Each landscape setting is different and should be evaluated on a case-by-case basis. There may be instances where the visual objective can be attained while the unit size is greater than the guideline, and there also may be instances where the unit must be smaller to meet the intent of the Visual Quality Objective.
3. The following describes typical regeneration methods and approximate unit sizes for landscapes of different visual absorption capabilities for the VQO's adopted in this LUD.
  - VQO Partial Retention:
    - Low: Group selection or clearcut (approx. 2-10 acres)
    - Intermediate: Clearcut (approx. 10 - 40 acres)
    - High: Clearcut (approx. 40 - 60 acres)
  - VQO Modification:
    - Low: Clearcut (approx. 15 - 40 acres)
    - Intermediate: Clearcut (approx. 40 - 60 acres)
    - High: Clearcut (approx. 60 - 100 acres)
  - VQO Maximum Modification:
    - Low: Clearcut (approx. 50 - 75 acres)
    - Intermediate: Clearcut (approx. 80 - 100 acres)
    - High: Clearcut (approx. 80 - 100 acres)
4. Tree limbs, root wads, and tree stumps may require secondary treatment to meet the Partial Retention VQO in the foreground distance. For timber sales and road construction contracts, use clauses which address these concerns. Brush disposal funds may be appropriate to use in these settings.
- D. Seek to provide for a reasonable assurance of windfirm boundaries. To design for windfirmness, consider conditions such as soils, local wind patterns, tree height and size, and other site-specific factors.
- E. Manage even-aged timber stands at rotations beyond the age of Mean Annual Increment culmination (merchantable cubic foot basis).

## **Timber Stand Improvement: TIM25**

- A. Timber Stand Improvement activities that meet the visual and timber objectives of the Land Use Designation may be used.
- B. Continue evaluation of commercial thinning opportunities in second-growth stands on the Forest for enhancing timber growth and development, while improving the visual quality and habitat conditions for wildlife. Evaluation will be provided as part of the Alaska Region Second-Growth Management Program.

## **TRANSPORTATION      Transportation Operations: TRAN1**

- A. Develop and manage cost-effective transportation systems which integrate resource requirements consistent with Land Use Designation direction.
  1. To meet the Visual Quality Objectives, give special consideration to minimizing apparent landform modification (as seen from sensitive travel routes) during road and Log Transfer Facility location, design, and construction.



## Management Prescriptions

2. Perform integrated logging system and transportation system analysis to determine the least-cost facility (considering cost of construction, maintenance, and hauling) and design standards necessary to meet Land Use Designation objectives.
3. Give special emphasis to maintaining fish and wildlife habitat values, especially during road location and development of road management objectives.
  - \* If the need to restrict access is identified during project interdisciplinary review, roads may be closed, either seasonally or yearlong. (See Transportation Forest-wide Standards & Guidelines.)
4. Provide recreation access where appropriate.
5. Seek to avoid road crossings on existing trails or locating roads parallel to trails. Should no other feasible alternative exist, minimize site disturbance visible from the trail. Locate rock source developments away from trails to the extent possible, while meeting the objectives of this Land Use Designation.

### WILDLIFE

#### Wildlife Habitat Planning: WILD112

- A. Use existing inventories and evaluate the need for further project-specific inventories of wildlife habitat conditions during project analysis.
  1. Select Management Indicator Species (MIS) appropriate to the project area for project analysis. (See Wildlife Forest-wide Standards & Guidelines.)
- B. Consider wildlife habitat needs during project planning and implementation.
  1. Use the habitat needs of MIS to evaluate opportunities for, and consequences on, wildlife.
  2. In project planning, consider opportunities to allow for the elevational migration of wildlife.
- C. Coordinate road management with the needs of wildlife.

# SCENIC VIEWSHED

## Land Use Designation SV

### Goals

To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments as seen from Visual Priority Travel Routes and Use Areas.

To recognize the scenic values of suitable timber lands viewed from selected popular roads, trails, water travel routes, recreation sites, bays and anchorages, and to modify timber harvest practices accordingly.

To seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this Land Use Designation.

### Objectives

Within this Land Use Designation, apply the Visual Quality Objectives (VQO's) of Retention in the foreground distance zone, and Partial Retention in the middleground and background distance zones, as seen from the Visual Priority Travel Routes and Use Areas (see Appendix F). Apply the Maximum Modification VQO to all other areas.

Suitable forest lands are available for timber harvest. Utilize appropriate silvicultural systems consistent with the adopted VQO's. Other timber management considerations include:

- seek to reduce clearcutting when other methods will meet land management objectives;
- identify opportunities for diversifying the wood products industry (such as special forest products, and value-added local production);
- use forest health management to protect resource values;
- improve timber growth and productivity on commercial forest lands;
- plan, inventory, prepare, offer, sell, and administer timber sales and permits to ensure the orderly development of timber production;
- emphasize the overall reduction of costs, increase of revenues, and improvement of public service within the timber program.

Perform viewshed analysis in conjunction with project development to provide direction for retaining or creating a scenically-attractive landscape over time, and for rehabilitation of areas overly modified in the past.

Provide a spectrum of recreation and tourism opportunities consistent with the capabilities of this Land Use Designation. Semi-primitive to roaded experiences may be offered.

Design roads and trails to be compatible with the characteristic landscape.

Extend rotations, as necessary, to meet the Visual Quality Objectives.

## Desired Condition

In areas managed under the Scenic Viewshed Land Use Designation, forest visitors, recreationists, and others using identified popular travel routes and use areas will view a natural-appearing landscape. Management activities in the foreground will not be evident to the casual observer. Activities in the middleground and background will be subordinate to the characteristic landscape. Areas topographically screened from Visual Priority Travel Routes and Use Areas may be heavily modified. Within these viewsheds, timber harvest units are typically small and affect only a small percentage of the seen area. At any given point in time, roads, facilities, and other structures are either not visually evident or are subordinate to the landscape. A variety of successional stages providing wildlife habitat occur, although late successional stages predominate. Recreation and tourism opportunities in a range of settings are available. In the areas managed for Retention or Partial Retention VQO's, timber yields will generally be obtained through the use of small openings or uneven-aged systems. A yield of timber is produced which contributes to Forest-wide sustained yield.



# Management Prescriptions

## Scenic Viewshed Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP	All	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS	All	4-74
Soil And Water	S&W	All	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM	All	4-93
Trail	TRAI	All	4-100
Transportation	TRAN	All	4-102
Wetlands	WET	All	4-109
Wildlife	WILD	All	4-110

## Apply the following Land Use Designation and Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Meet the Visual Quality Objectives for this Land Use Designation when siting and constructing facilities for administrative use.
  - 1. Retention: Structures and activities should not be visually evident to the casual observer from sensitive viewpoints.
  - 2. Partial Retention: Structures and activities should be subordinate to the landscape character of the area.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression option identified in the Southeast Alaska/Prince William Sound Fire Management Plan. An Escaped Fire Situation Analysis (EFSA) of expected fire behavior, time of year, and locations with respect to private land and adjacent land use areas, may lead to a lower strategy. If an EFSA discloses no adverse effects and it is more cost-efficient, the lower strategy will be used.
- B. Suppression tactics are limited only by the standards for the Land Use Designation, such as soil, water quality, and scenery.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Management-ignited prescribed fire must meet the retention VQO and meet all soil and water quality standards.
  - 1. Treat all activity fuels to meet the Retention VQO within one year following timber harvest.
- B. Do not use prescribed natural fire.

### FISH

#### Fish Habitat Improvements: FISH22

- A. Meet the Visual Quality Objectives in the design and construction of fish habitat improvements and aquaculture facilities.
  - 1. Construct facilities from materials which blend with, and are compatible with, the immediately surrounding landscape.

### FOREST HEALTH

#### Forest Health Management: HEALTH1

- A. Design Timber Stand Improvement, sanitation, salvage, and insect and disease management activities to be consistent with scenery and forest health objectives.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Inventory*

- A. Provide heritage resource assistance to all development proposals. Coordination includes participation and support for environmental analysis, inventory, evaluation, assessment, monitoring and protection of Heritage Resources during activities.



# Management Prescriptions

1. Heritage Resource inventory will be accomplished during project planning. SHPO concurrence and Forest Supervisor approval is required prior to implementation.
2. Heritage Resource Specialists shall provide input on known or predicted heritage resource site density in proposed project areas and make recommendations to manage Heritage Resources.
3. Should any Heritage Resources be discovered during project activity, all work within the vicinity of the discovery shall cease until a heritage resource specialist is able to evaluate the situation and resumption of activity is approved by the Forest Supervisor.

## **KARST AND CAVES      Cave Management Program: CAVE**

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this Land Use Designation.

## **LANDS**

### **Special Use Administration (non-Recreation): LAND122**

- A. Allow construction of structures only when Visual Quality Objectives can be achieved.
  1. Permit only structures which will not be evident to casual observers when viewed in the foreground distance from Visual Priority Travel Routes and Use Areas. In the middle to background distance, design structures to be subordinate to the characteristic landscape.
  2. Specify that materials and fabrication techniques for all new facilities be compatible with form, color and texture found in the immediately surrounding landscape.
- B. This Land Use Designation represents a Transportation and Utility Systems (TUS) "Window" and provides opportunities for the future designation and location of transportation and utility sites or corridors.

### **Landline Location and Maintenance: LAND231, LAND24**

- A. Provide adequate landline marking for Forest Service contractors.
  1. Prior to Forest Service management activities, survey, mark, and post the boundary of National Forest System lands to Forest Service Standards, where there is a risk of trespass.

## **MINERALS AND GEOLOGY**

### **Minerals and Geology Resource Preparation: MG11**

- A. Require a visual assessment and visual resource assistance with site planning and design of minerals activities.

### **Minerals and Geology Administration: MG12**

#### *Forest Lands Open to Mineral entry*

- A. Forest lands within this Land Use Designation are open to mineral entry.
- B. Assure prospectors and claimants their right of ingress and egress granted under the General Mining Law of 1872, ANILCA, and Forest Service Mining Regulations 36 CFR 228.
- C. Permit reasonable access to mining claims in accordance with the provisions of an approved Plan of operations.



## *Plan of operations*

- A. Encourage use of state-of-the-art techniques for developing minerals to reduce impacts to the extent reasonable. Include mitigation measures that are compatible with the scale of proposed development and commensurate with potential resource impacts.
- B. Apply Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads.
- C. Manage mineral activities to be compatible with the emphasis of this Land Use Designation. Apply the following management practices to meet Visual Quality Objectives.
  - 1. Recognize the effects of color, tone, form, texture, line, size, and edge on the scenic viewshed.
  - 2. Locate material disposal sites and marine transfer facilities outside this Land Use Designation if reasonable alternatives exist.
  - 3. Take maximum advantage of topographic and vegetative screening when locating drill rigs and pumps, roads, rock quarries, structures, and marine transfer facilities.
  - 4. Ensure that vegetation removed from the project area is hauled away, buried, burned, or scattered when such vegetation is located adjacent to sensitive viewpoints.
  - 5. Minimize the scale of spoil/disposal areas in relation to the surrounding landscape as seen from sensitive viewpoints.
  - 6. Approve use of colors that simulate those found in the characteristic landscape. Avoid use of reflective materials in project facilities.
  - 7. Ensure that landform modifications simulate naturally-occurring forms.
  - 8. Ensure that disturbed area are revegetated in accordance with project plans.

## **RECREATION AND TOURISM**

### **Recreation Use Administration: REC122**

#### *Recreation Settings*

- A. Provide a spectrum of recreation and tourism opportunities consistent with the objectives of this Land Use Designation.
  - 1. Where possible, management activities should avoid change to inventoried Recreation places unless analysis indicates a need to provide a different recreation opportunity.
  - 2. In locations where approved activities occur, the recreation setting may change to the Semi-primitive Motorized, Roaded Natural, and Roaded Modified ROS classes.
  - 3. Seek to maintain recreation opportunities along existing trail corridors by minimizing road crossings and clearing directly adjacent to the trail.
  - 4. Seek to minimize impacts to areas directly adjacent to developed recreation and tourism facilities (such as cabins and campgrounds) through scheduling and location of timber harvest activities.
- B. In those areas identified as inventoried Recreation places, seek to maintain the existing ROS setting. When scheduled activities nearby may result in a change in the ROS setting, minimize the impacts so they maintain a Roaded Natural, or more natural setting.

#### *Recreation Special Uses*

- A. Major and minor developments are compatible with this Land Use Designation, and applicants are encouraged to examine these areas first. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

# Management Prescriptions

## SCENERY

### Scenery Operations: VIS1

- A. Manage areas to maintain scenic quality as seen from Visual Priority Travel Routes and Use Areas.
  1. Apply the Retention Visual Quality Objective (VQO) for lands in the foreground distance zone, and the Partial Retention VQO for lands in the middleground and background distance zones, as seen from Visual Priority Travel Routes and Use Areas (see Appendix F). In areas of this allocation not seen from the Visual Priority Travel Routes and Use Areas, apply the Maximum Modification VQO. These objectives define the maximum limit of allowable change to the visual character of the area; less visible evidence of activities is acceptable.
  2. Exceptions for small areas of non-conforming developments, such as recreation sites, transportation developments, Log Transfer Facilities and mining development, may be considered on a case-by-case basis.
  3. Perform viewshed analysis in conjunction with project development to provide guidance for retaining or creating a visually attractive landscape over time.

## SOIL AND WATER

### Watershed Resource Planning: S&W112

- A. Delineate the location of soil and water protection areas on appropriate project maps to insure their recognition, proper consideration, and protection of the sale area.
- B. Manage non-designated domestic water use watersheds for multiple use, while providing water suitable for human consumption under of State Water Quality Standards and water supply regulations.
- C. Apply Best Management Practices (BMP's) to all land-disturbing activities as a process to protect the beneficial uses of water from non-point sources of pollution. (Appendix C of this plan includes a summary of Best Management Practices which are found in Chapter 10 of the Soil and Water Conservation Handbook, 2502.22). Also consult FSM 2530, Facilities and Transportation Forest-wide Standards & Guidelines, U.S. Army Corps of Engineers Regulations (33 CFR 323.4) and the Clean Water Act.

### Watershed Resource Improvements: S&W2

- A. Accomplish soil and water improvement projects on non-designated domestic water use watersheds to prevent degradation of water quality below the State of Alaska's Water Quality Standard for domestic use.

## TIMBER

### Timber Resource Planning: TIM112

- A. Suitable forested land is available for harvest and is included in the Allowable Sale Quantity calculation. Tentatively suitable lands assigned to no harvest by standard or guideline are unsuitable and not included in the Allowable Sale Quantity calculation.

### Timber Resource Coordination: TIM113

- A. Visual objectives will be emphasized in the analysis, in the development of environmental documents, and in the design and implementation of silvicultural activities.
- B. Personal use wood cutting activities are compatible with this Land Use Designation provided that management objectives are met.



## Timber Sale Preparation: TIM114

- A. Timber harvest activities may include all applicable silvicultural systems. Project analysis will recognize the effects of color, tone, form, texture, line, slope, size, and edge on the scenic viewshed.
- B. The following guidelines provide direction for timber harvest activities to meet Visual Quality Objectives (VQO) and Visual Absorption Capability (VAC) settings.
  1. Retention - The Retention Visual Quality Objective requires that timber harvest activities are not evident to the casual Forest visitor.
  2. Partial Retention - The Partial Retention Visual Quality Objective requires that, although timber harvest activities are evident, they must remain subordinate to the characteristic landscape.
  3. Maximum Modification - Management activities may dominate the area.
- C. The following guidelines provide specific visual mitigation measures appropriate to timber management.
  1. The ability to attain the adopted Visual Quality Objective is dependent on many variables. Visual Absorption Capability (VAC) is an estimate of the relative ability of a landscape to absorb management activities. VAC ratings of High, Intermediate, and Low were derived from the Revision Database for analysis purposes. A Low VAC setting generally has steep slopes, with little landscape variety, while a High VAC setting is relatively flat and/or has a high degree of variety in the landscape.
  2. The unit sizes listed below provide guidance to the project IDT. Each landscape setting is different, and should be evaluated on a case-by-case basis. There may be instances where the visual objective can be attained while the unit size is greater than the guideline, and there also may be instances where the unit size must be smaller to meet the intent of the Visual Quality Objective.
  3. The following describes typical regeneration methods and approximate unit sizes for landscapes of different visual absorption capabilities for the VQO's adopted in this Land Use Designation.
    - VQO Retention:  
Low: Single tree or group selection (less than 2 acres)  
Intermediate: Single tree or clearcut (approx. 5 - 15 acres)  
High: Clearcut (approx. 15 - 30 acres)
    - VQO Partial Retention:  
Low: Group selection or clearcut (approx. 2-10 acres)  
Intermediate: Clearcut (approx. 10 - 40 acres)  
High: Clearcut (approx. 40 - 60 acres)
    - VQO Maximum Modification:  
Low: Clearcut (approx. 50 - 75 acres)  
Intermediate: Clearcut (approx. 80 - 100 acres)  
High: Clearcut (approx. 80 - 100 acres)
  4. Tree limbs, root wads, and tree stumps may require secondary treatment to meet the Retention and Partial Retention VQO. For timber sales and road construction contracts, use appropriate clauses which address these concerns. Brush disposal funds may be appropriate to use in these settings.
  5. Seek to minimize impacts to areas directly adjacent to developed recreation facilities (such as cabins and campgrounds) through scheduling and location of harvest activities.



# Management Prescriptions

## TRANSPORTATION    Transportation Operations: TRAN1

- A. Develop and manage cost-effective transportation systems which integrate resource requirements consistent with Land Use Designation direction.
  - 1. To meet the Visual Quality Objectives, give special consideration to minimizing apparent landform modification (as seen from sensitive travel routes) during road and Log Transfer Facility location, design, and construction.
  - 2. Perform integrated logging system and transportation system analysis to determine the least cost facility (considering cost of construction, maintenance, and hauling) and design standards necessary to meet Land Use Designation objectives.
  - 3. Give special emphasis to maintaining fish and wildlife habitat values, especially during road location and development of road management objectives.
    - If the need to restrict access is identified during project interdisciplinary review, roads may be closed, either seasonally or yearlong. (See Transportation Forest-wide Standards & Guidelines.)
  - 4. Provide recreational access where appropriate.
  - 5. Seek to avoid road crossings on existing trails or locating roads parallel to trails. Should no other feasible alternative exist, minimize site disturbance visible from the trail. Locate rock source developments away from trails to the extent possible, while meeting the objectives of this Land Use Designation.

## WILDLIFE

### Wildlife Habitat Planning: WILD112

- A. Use existing inventories and evaluate the need for further project-specific inventories of wildlife habitat conditions during project analysis.
  - 1. Select Management Indicator Species (MIS) appropriate to the project area for project analysis. (See Wildlife Forest-wide Standards & Guidelines).
- B. Coordinate all activities with consideration for the needs of wildlife, within the overall objectives of this Land Use Designation.
  - 1. Use the habitat needs of MIS to evaluate opportunities for, and consequences on, wildlife.
  - 2. In project planning, consider opportunities to allow for the elevational migration of wildlife.
  - 3. Consider silvicultural techniques which establish and prolong understory forb and shrub production in important habitat areas. Such techniques can include prescribed burning, precommercial thinning, canopy gaps, and uneven-aged management.
- C. Coordinate road management with the needs of wildlife.

### Wildlife Habitat Improvement: WILD22

- A. Design and implement wildlife habitat improvement projects to meet the Visual Quality Objectives.

# OLD-GROWTH HABITAT

## Land Use Designation OG

### Goals

Maintain areas of old-growth forests and their associated natural ecological processes to provide habitat for old-growth associated resources.

Manage early seral conifer stands to achieve old-growth forest characteristic structure and composition based upon site capability. Use *old growth definitions as outlined in Ecological Definitions for Old-growth Forest Types in Southeast Alaska* (R10-TP-28).

### Objectives

Provide old-growth forest habitats, in combination with other Land Use Designations, to maintain viable populations of native and desired non-native fish and wildlife species and subspecies that may be closely associated with old-growth forests.

Contribute to the habitat capability of fish and wildlife resources to support sustainable human subsistence and recreational uses.

Maintain components of flora and fauna biodiversity and ecological processes associated with old-growth forests.

Allow existing natural or previously-harvested early seral conifer stands to evolve naturally to old-growth forest habitats, or apply silvicultural treatments to accelerate forest succession to achieve old-growth forest structural features. Consider practices such as thinning, release and weeding, pruning, and fertilization to promote accelerated development of old-growth characteristics.

To the extent feasible, limit roads, facilities, and permitted uses to those compatible with old-growth forest habitat management objectives.

### Desired Condition

All forested areas within this Land Use Designation have attained old-growth forest characteristics. A diversity of old-growth habitat types and associated species and subspecies and ecological processes are represented.



# Management Prescriptions

## Old-growth Habitat Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH	All	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP1 RIP2	All I, II(A-E, G, H)	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS1, 12 VIS11	All I, II(A, E)	4-74
Soil And Water	S&W111, 1112, 2 S&W112	All I(A:1-4, 6-7), II, III	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM111, 111-1, 130, 140 TIM114	All VIII	4-93
Trails	TRAI	All	4-100
Transportation	TRAN	All	4-102
Wetlands	WET	All	4-109
Wildlife	WILD112  WILD 22, 23	I-VIII; IX(A:1-8, 11, B); X-XVIII All	4-110



## Apply the following Land Use Designation Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Allow administrative and recreational facilities when compatible with Land Use Designation objectives.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression option identified in the Southeast Alaska/Prince William Sound Fire Management Plan. An Escaped Fire Situation Analysis (EFSA) of expected fire behavior, time of year, and locations with respect to private land and adjacent land use areas, may lead to a lower strategy. If an EFSA discloses no adverse effects and it is more cost-efficient, the lower strategy will be used.
- B. Suppression tactics are limited only by the standards for this Land Use Designation, such as soil and watershed concerns.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Allow management-ignited prescribed fire where its use maintains old-growth characteristics.
- B. Do not use prescribed natural fire.

### FISH

#### Fish Habitat Planning: FISH112

- A. Emphasize the protection and restoration of fish habitat, fish production and aquatic biodiversity. Enhancement projects that may change the natural distribution of fish species within a watershed are consistent with Land Use Designation objectives.

### FOREST HEALTH

#### Forest Health: HEALTH1

- A. Insect and disease management measures consistent with this Land Use Designation may be implemented to protect the old-growth forest component and adjacent resources.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Inventory/Evaluation*

- A. Develop priorities and schedule management activities to implement heritage resource inventory, evaluation, protection, and interpretation.
  - 1. Identify, classify, and evaluate known Heritage Resources.
  - 2. Identify heritage properties to be nominated to the National Register of Historic Places.
  - 3. Identify heritage properties that require stabilization or other protective measures.
  - 4. Identify opportunities for interpretation of Heritage Resources for public education and enjoyment.

# Management Prescriptions

## KARST AND CAVES Cave Management Program: CAVE

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this Land Use Designation.

## LANDS

### Special Use Administration (Non-Recreation): LAND122

- A. Permit only improvements (such as tent platforms, fish weirs, minor waterlines, minor powerlines, etc.) which are compatible with Land Use Designation objectives.
- B. This Land Use Designation represents a Transportation and Utility Systems (TUS) "Avoidance Area." Transportation and utility sites or corridors may be located within this Land Use Designation only after an analysis of potential TUS corridor opportunities has been completed and no feasible alternatives exist outside this Land Use Designation.

## MINERALS AND GEOLOGY

### Minerals and Geology Administration: MG12

#### *Forest Lands Open to Mineral entry*

- A. Forest lands within this Land Use Designation are open to mineral entry.
- B. Assure prospectors and claimants their right of ingress and egress granted under the General Mining Law of 1872, ANILCA, and National Forest Service Mining Regulations 36 CFR 228.
- C. Permit reasonable access to mining claims in accordance with the provisions of an approved Plan of operations.

#### *Plan of operations*

- A. Work with claimants to develop a Plan of operations that minimizes, monitors, and mitigates adverse impacts to Land Use Designation objectives. Monitoring plans should specifically assess impacts to threatened, endangered or sensitive species or other significant fish and wildlife resources. Include mitigation measures that are compatible with the scale of proposed development and commensurate with potential resource impacts.
- B. Apply Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads and facilities.
- C. Manage mineral exploration and development activities to be compatible with Land Use Designation objectives. Apply the following management practices to avoid or reduce impacts.
  1. Manage mineral activities to maintain the present habitat capability and continued productivity of anadromous fish and other foodfish habitat to the maximum extent feasible. (Consult ANILCA, Section 505 (a).)
  2. Take advantage of topographic and vegetative screening when locating drill rigs and pumps, roads, rock quarries, structures, and marine transfer facilities.
  3. Locate material sites and marine transfer facilities outside this Land Use Designation if reasonable alternatives exist.
  4. Minimize the scale of spoil/disposal areas in relation to the surrounding landscape as seen from sensitive viewpoints to leave a naturally-appearing condition.
  5. Ensure that disturbed areas are revegetated in accordance with project plans, emphasizing the use of native vegetation and local genetic plant stocks.



6. Apply timing restrictions to minerals activities as needed to prevent or minimize disturbance to fish and wildlife during critical life stages (e.g., spawning, molting, nesting, or brood-rearing).

### RECREATION AND TOURISM

#### Recreation Use Administration: REC122

##### *Recreation Management and Operations*

- A. Manage recreation and tourism use to meet Land Use Designation objectives for fish and wildlife resources and habitat.
  1. Design and locate recreation-related structures to be compatible with habitat needs of old-growth associated species.
  2. Manage Off-Highway Vehicle use to prevent degradation of habitat or adverse disturbance to fish and wildlife populations.
- B. Generally provide for semi-primitive ROS settings, recognizing that more developed settings may be present due to authorized activities, existing use patterns, and activities in adjacent Land Use Designations.

##### *Recreation Special Uses*

- A. Minor recreation and tourism developments may be compatible with the Land Use Designation objectives depending on the scope, purpose, and magnitude of the proposal. Proposals will be evaluated on a case-by-case basis. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

### SCENERY

#### Scenery Operations: VIS1

- A. Apply Forest-wide Standards & Guidelines for the Retention Visual Quality Objective. Design activities to not be visually evident to the casual observer.
- B. Exceptions for small areas of non-conforming developments, such as recreational developments, transportation developments, Log Transfer Facilities, and mining development, may be considered on a case-by-case basis. Use designs and materials that are compatible with forms, colors, and textures found in the characteristic landscape.

### SOIL AND WATER

#### Watershed Resource Improvements: S&W2

- A. Undertake watershed improvements only where deteriorated soil and hydrologic conditions create a threat to the goals and objectives for which the old-growth habitat is managed. Rehabilitation or stabilization projects will seek to enable the area to retain its natural appearance.

### TIMBER

#### Timber Resource Planning: TIM112

- A. Forest land is classified as unsuitable for timber production.
- B. Beach log salvage is compatible with this Land Use Designation.
- C. Personal use wood harvest is allowed within locally determined areas if determined to be consistent with Land Use Designation objectives. Salvage of bridge stringer logs is permitted.

#### Timber Sale Preparation: TIM114

- A. Salvage of dead or down material is permitted, but is limited to roadside windfall and hazard trees immediately adjacent to existing permanent roads and catastrophic windthrow events or large insect or disease outbreaks (generally exceeding 100 acres). Limited standing undamaged timber (up



## Management Prescriptions

to 20% of total salvage) may be removed only for safety reasons or for feasibility of salvage operations. Salvage sales must be compatible with Land Use Designation objectives as determined through the environmental analysis process. Stands once salvaged will be managed to achieve old-growth habitat characteristics. During the environmental analysis, consider the scale of the affected area salvaged. If reserve design criteria are no longer met, adjust reserve locations to better meet reserve size, spacing and composition criteria if lands are available (see Wildlife Planning, section B below, and Appendix K).

### TRANSPORTATION      Transportation Operations: TRAN1

- A. New road construction is generally inconsistent with Old-growth Habitat Land Use Designation objectives, but new roads may be constructed if no feasible alternative is available.
  - 1. Perform integrated logging system and transportation analysis (including Access and Travel management planning) to determine if other feasible routes avoiding this Land Use Designation exist during the project environmental analysis process. If no feasible alternative routes exist, locate, design, and construct roads in a manner which minimizes adverse impact to fish and wildlife resources to the extent feasible, and will be compatible with Land Use Designation objectives. Keep clearing widths to the minimum feasible. Consider enforcement costs of road closures in the integrated logging system and transportation analysis.
  - 2. If reserve design criteria are no longer met, adjust reserve locations to meet reserve size, spacing and composition criteria if lands are available (see Wildlife Planning, section B below, and Appendix K).
  - 3. For timber salvage, use logging systems that do not require additional permanent road construction.
- B. Manage existing roads to meet Land Use Designation objectives.
  - 1. In Old-growth Habitat Land Use Designations with existing roads, develop or update Road management objectives to meet Land Use Designation objectives (see Wildlife (brown bear and wolf) and Transportation Forest-wide Standards & Guidelines). Use of existing roads may continue pending the development or update of Road management objectives (see Appendix L).
  - 2. Road management objectives may include temporary or permanent road closures and may be specific to individual road specification types (e.g., keep mainlines open, close arterial and spur).
  - 3. Road maintenance and reconstruction may be permitted if consistent with road management objectives.
- C. Sites for Log Transfer Facilities may be considered in this Land Use Designation. If no other feasible alternative sites exist, locate, design, construct, and manage these facilities in a manner which will be compatible with Land Use Designation objectives.

### WILDLIFE

#### Wildlife Habitat Planning: WILD122

- A. Maintain contiguous blocks of old-growth forest habitat in a forest-wide system of old-growth reserves to support viable and well-distributed populations of old-growth associated species and subspecies.
- B. A system of large, medium and small old-growth habitat reserves has been identified and mapped in the forest plan as part of a forest-wide old-growth habitat reserve strategy. The mapped large and medium reserves

generally achieve reserve strategy objectives, and few major modifications are anticipated. The small mapped reserves have received differing levels of ground-truthing and integration of site-specific information in their design. During project level environmental analysis, for projects areas that include or are adjacent to mapped old-growth habitat reserves, the size, spacing and habitat composition of mapped reserves may be further evaluated. (See Appendix K for mapping criteria.)

1. Adjust reserves not meeting the minimum criteria to meet or exceed the minimum criteria.
  2. Reserve location, composition, and size may otherwise also be adjusted. Alternative reserves must provide comparable achievement of the Old-growth Habitat Land Use Designation Goals and Objectives. Determination as to comparability must consider the criteria listed in Appendix K.
  3. Adjustments to individual reserves described in 1. and 2. above are not expected to require a significant plan amendment. Adjustments Forest-wide shall be monitored yearly to assess whether a significant plan amendment is warranted on the basis of cumulative changes.
- C. Allow previously harvested or natural early seral stands to develop into old-growth habitats, or provide young-growth management to accelerate attainment of old-growth characteristics. (See WILD22, below).

### **Wildlife Habitat Restoration: WILD22**

- A. Manage early seral forest stands for purposes of wildlife habitat development. Allow techniques such as thinning, pruning, and planting to accelerate development of advanced seral stand structure including maintenance of shrub and forb understory.



# SEMI-REMOTE RECREATION

## Land Use Designation SM

### Goals

To provide predominantly natural or natural-appearing settings for semi-primitive types of recreation and tourism and for occasional enclaves of concentrated recreation and tourism facilities.

To provide opportunities for a moderate degree of independence, closeness to nature, and self-reliance in environments requiring challenging motorized or non-motorized forms of transportation.

### Objectives

Manage recreation and tourism use and activities to meet the levels of social encounters, on-site developments, methods of access, and visitor impacts indicated for the Semi-primitive Recreation Opportunity Spectrum classes. Enclaves of concentrated recreation and tourism developments within the Land Use Designation or management activities in adjacent Land Use Designations may cause the ROS setting to become Rural.

Determine on a case-by-case basis whether roads, trails, and other areas should be closed to motorized recreation activities. If so, incorporate into Off-Highway Vehicle (OHV) plans. If not, the use of boats, aircraft, and snowmachines for traditional activities is allowed.

Permit small-scale, rustic recreation and tourism facilities, and occasional enclaves of concentrated recreation and tourism facilities.

Apply the Partial retention Visual Quality Objective to any developments, facilities, or structures.

Fish enhancement and wildlife habitat improvement may occur.

### Desired Condition

Areas in the Semi-remote Recreation Land Use Designation are characterized by generally unmodified natural environments. Ecological processes and natural conditions are only minimally affected by past or current human uses or activities. Users have the opportunity to experience a moderate degree of independence, closeness to nature, solitude and remoteness, with some areas offering motorized opportunities and others non-motorized opportunities (except for the traditional uses of boats, aircraft, and snowmachines). Interactions between users are infrequent. Facilities and structures may be minimal or occasionally may be larger in scale, but will be rustic in appearance, or in harmony with the natural setting.



## Semi-remote Recreation Land Use Designation

Apply the following Forest-wide Standards &amp; Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH1 BEACH2	All I,II(A-G,K,L)	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest Health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST, CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP RIP2	All I,II(A-E,G,H)	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS1,12 VIS11	All I,II(A-B,E)	4-74
Soil And Water	S&W1111,1112,2 S&W112	All I(A:1-4,6-7),II,III	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM111,111-1,130,140 TIM114	All VIII	4-93
Trails	TRAI	All	4-100
Transportation	TRAN111,122,212,22,23 TRAN214	All I(A,B,D-F);II-IV	4-102
Wetlands	WET	All	4-109
Wildlife	WILD112 WILD22 WILD23	I-VIII; IX(A:1-8;11,B); X-XV I(A:1;B) All	4-110



# Management Prescriptions

## Apply the following Land Use Designation Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Design and locate administrative and non-recreation structures to reduce adverse effects on recreation and tourism opportunities.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression option identified in the Southeast Alaska/Prince William Sound Fire Management Plan. An Escaped Fire Situation Analysis (EFSA) of expected fire behavior, time of year, and locations with respect to private land and adjacent Land Use Designations, may lead to a lower strategy. If an EFSA discloses no adverse effects and it is more cost-efficient, the lower strategy will be used.
- B. Emphasize suppression tactics which result in the least possible disturbance or evidence of human presence.
  1. Suppression tactics will avoid human/bear conflicts and existing policy will be emphasized to leave no trash or any other kinds of bear attractants in the area.
  2. Rehabilitation of all campsites, suppression lines, and other evidence of human presence will occur as soon as it is safe, but within one year after the fire occurs.
  3. Mechanized fireline construction will avoid important wildlife habitat areas such as meadows, bogs, and riparian areas.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Management ignitions, although they are not presently used in this Land Use Designation, may be used as an acceptable means of fuels management and wildlife habitat improvement so long as its use is compatible with Land Use Designation objectives.
- B. As a general management practice, do not use prescribed natural fire. Should it become necessary to consider the use of prescribed natural fire, the Forest Plan must be amended to analyze, justify, and approve prescribed natural fire programs. (Consult FSM 5142.)

### FOREST HEALTH

#### Forest Health Management: HEALTH1

- A. Insect and disease management measures consistent with Land Use Designation objectives may be implemented to protect recreation and tourism opportunities, and adjacent resources.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Enhancement*

- A. Heritage Resources are available for recreational, scenic, scientific, educational, conservation, and historic uses.
  1. Provide interpretive information concerning Heritage Resources located within this Land Use Designation to users in the form of exhibits and publications located outside of this Land Use Designation.

2. Heritage Resources are available for scientific studies that are consistent with the semi-primitive settings and activities, and heritage resource management objectives for the specific site.

### *Inventory/Evaluation*

- A. Develop priorities and schedule management activities to implement heritage resource inventory, evaluation, protection, and interpretation.
  1. Identify, classify, and evaluate known Heritage Resources.
  2. Identify heritage properties to be nominated to the National Register of Historic Places.
  3. Identify heritage properties that require stabilization or other protective measures.
  4. Identify opportunities for interpretation of Heritage Resources for public education and enjoyment.

## **KARST AND CAVES      Cave Management Program: CAVE**

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this Land Use Designation.

## **LANDS**

### **Special Use Administration (Non-Recreation): LAND122**

- A. Permit only facilities and uses consistent with Semi-remote Recreation Land Use Designation objectives.
- B. This Land Use Designation represents a Transportation and Utility System (TUS) "Window" and provides opportunities for the future designation and location of Transportation and Utility sites.

## **MINERALS AND GEOLOGY**

### **Minerals and Geology Administration: MG2**

#### *Forest Lands Open to Mineral entry*

- A. Forest lands within this Land Use Designation are open to mineral exploration and development.
- B. Assure prospectors and claimants their right of ingress and egress granted under the General Mining Law of 1872, ANILCA, and National Forest Service Mining Regulations 36 CFR 228.
- C. Permit reasonable access to mining claims in accordance with the provisions of an approved Plan of operations.

#### *Plan of operations*

- A. Encourage use of state-of-the-art techniques for developing minerals to reduce impacts to the extent feasible.
- B. Apply appropriate Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads and facilities.
- C. Manage mineral exploration and development activities to be compatible with the emphasis of this Land Use Designation. Apply the following management practices to reduce resource impacts.
  1. Manage mineral activities to maintain the present and continued productivity of anadromous fish and other foodfish habitat to the maximum extent feasible. (Consult ANILCA, Sec. 505 (a).)
  2. When locating drill rigs and pumps, roads, rock quarries, structures, and marine transfer facilities, take maximum advantage of topographic and vegetative screening.



## Management Prescriptions

4. Ensure that vegetation removed from the project area is hauled away, buried, burned, or scattered when such vegetation is located adjacent to Visual Priority Travel Routes and Use Areas.
5. Minimize the scale of spoil/disposal areas in relation to the surrounding landscape as seen from Visual Priority Travel Routes and Use Areas.
6. Approve use of colors that simulate those found in the characteristic landscape. Avoid the use of reflective materials in project facilities.
7. Approve reclamation plans in which minerals activities leave a natural-appearing condition.
8. Ensure that landform modifications simulate naturally-occurring forms.
9. Ensure that disturbed areas are revegetated in accordance with project plans.

### RECREATION AND TOURISM

#### Recreation Use Administration: REC122

##### *Recreation Management and Operations*

- A. Generally, manage for Semi-primitive Recreation Opportunity Spectrum (ROS) settings. Enclaves of concentrated recreation and tourism developments within the Land Use Designation or management activities in adjacent Land Use Designations may cause the ROS setting to become Roded Natural, Roded Modified, or Rural.
- B. Determine on a case-by-case basis whether roads, trails, and other areas should be closed to motorized recreation activities; incorporate determinations in Off-Highway Vehicle (OHV) Plans.
  1. Manage roads for Traffic Service Level D except when level C roads provide access to or through the Land Use Designation. Occasional enclaves of concentrated recreation and tourism developments could warrant higher service levels in those areas.
- C. Where roads, trails, and other areas are closed to motorized recreation activities or vehicles, provide Semi-primitive Non-motorized recreation opportunities.
  1. Permit use of snowmachines, motorboats, and aircraft for traditional activities.
- D. Permit small scale, rustic recreation and tourism facilities such as recreation cabins, shelters, docks, and enclaves of concentrated recreation and tourism development.
  1. During all construction activity:
    - Minimize site modification.
    - Minimize vegetation clearing adjacent to the site.
    - Use colors found in the natural environment.

##### *Recreation Special Uses*

- A. Major and minor developments are compatible with this Land Use Designation. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

### SCENERY

#### Scenery Operations: VIS1

- A. Design resource activities to remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color or texture common to the landscape. New form, line, color, or texture will be subordinate to the characteristic landscape.
  1. Apply Forest-wide Standards & Guidelines for the Partial retention Visual Quality Objective.
  2. There may be cases where facilities associated with a concentrated recreation or tourism development may not feasibly meet the Partial

retention objective. After analysis of the proposal and public involvement, the NEPA decision document for this project should determine the specific Visual Quality Objective for the development. The environmental analysis shall also prescribe design guidelines necessary to meet this visual objective. During the project's design phase, the Forest Service shall be closely involved in the review of design work as it evolves.

3. Design visitor facilities to blend, to the extent feasible, with the natural setting.
- B. Rehabilitation techniques may be used to restore disturbed landscapes to be compatible with the semi-primitive setting.

### **TIMBER**

#### **Timber Resource Planning: TIM112**

- A. Forested land is classified as unsuitable for timber production.
- B. The following types of uses may be authorized when they meet Land Use Designation objectives.
  1. Removal or use of trees for improvement of recreation and tourism opportunities, such as clearing for vistas, campsites, or trails.
  2. Removal, or use of trees cut as a part of some other authorized use within this Land Use Designation. For example, clearing for a fish ladder or road.
  3. Trees may be cut for use in construction and maintenance of authorized structures when it is not feasible to obtain the necessary material from outside this Land Use Designation.
- C. Personal use wood harvest from beach log salvage is fully compatible with this Land Use Designation. Personal use wood cutting is allowed based on local determination.

#### **Timber Sale Preparation: TIM114**

- A. Salvage will be limited to dead and/or down material resulting from events such as windthrow and insect or disease mortality. Limited standing green timber may be harvested during salvage operations for safety and operational considerations.

### **TRANSPORTATION**

#### **Transportation Operations: TRAN1**

- A. Where Semi-primitive Motorized recreation opportunities are emphasized, existing low standard roads are generally managed for use by high clearance or Off-Highway Vehicles, snowmobiles or motorcycles subject to an approved Off-Highway Vehicle Management Plan. Generally, new roads are not constructed in this area, except to link existing roads or provide access to adjacent Land Use Designations.
  1. Limit the design standards of Forest Development Roads to those commensurate with the intended use.
  2. Maintain as necessary to provide passage of planned traffic.
  3. Locate and design new roads to consider semi-primitive recreation opportunities in this Land Use Designation.
- B. Where Semi-primitive Non-motorized recreation opportunities are emphasized, provide foot or cross-country ski trails. Roads and trails may be closed or seasonally restricted. Close or obliterate existing roads except for transportation system links.



## **SPECIAL INTEREST AREA**

### **Land Use Designation SA**

#### **Goals**

To provide for the inventory, maintenance, interpretation, and protection of the existing characteristics and attributes of areas with unique cultural, geological, botanical, zoological, recreational, scenic, or other special features.

#### **Objectives**

Provide opportunities for public study, use, and enjoyment of unique natural areas that are suitable to, and do not compromise, the characteristics of each area.

Allow only facilities and recreation developments that contribute to the interpretation of natural features or provide for compatible public uses, and that blend with the natural setting.

Provide for existing Recreation Opportunity Spectrum opportunities and activities, unless public use is specifically restricted for the protection of other resources.

Consider withdrawing each area from mineral entry, subject to valid existing rights, on a case-by-case basis, if mineral development would not be consistent with protecting the unique features of the area.

Apply the Retention Visual Quality Objective except around developed interpretive facilities, and other developments or structures.

Allow fish, wildlife, and/or soil and water improvements if they are compatible with the purposes for which each Special Interest Area was established.

Develop management plans for those Special Interest Areas needing specific direction for achieving these goals and objectives.

#### **Desired Condition**

All Special Interest Areas on the Tongass National Forest are characterized by generally unmodified environments in which unique natural features are preserved. They remain largely undisturbed by human uses or activities, except for localized interpretive purposes and, in some cases, recreation developments, and provide quality opportunities for public study, use, and enjoyment. Each is an example of one or more cultural, geological, botanical, zoological, paleontological, or other special features unique within the Tongass.

- ♦ Cultural areas possess prehistoric/historic sites, buildings, or artifacts of National Register of Historic Places Significance or having special cultural associations with Native Americans.
- ♦ Scenic Areas are comprised of landscapes of outstanding beauty or natural characteristics, such as glaciers, alpine, and areas of diverse vegetative patterns/coverage. These are areas which could be viewed for a long duration from specific vantage points, such as developed recreation sites, trails, anchorages, travel routes, and communities.
- ♦ Geological Areas have unique geologic features of the earth's development including caves, volcanic features, stratigraphic and structural features, and fossilized specimens of plants and animals.



## Management Prescriptions

- ♦ Botanical Areas contain specimens or groups of plants, plant groups, and plant communities which are significant because of form, color, occurrence, habitat location, life history, arrangement, ecology, environment, rarity and/or other features.
- ♦ Zoological Areas contain unique or significant animals, animal groups, or animal communities, habitat, location, life history, ecology, environment, rarity or other features.

## Special Interest Area Land Use Designation

Apply the following Forest-wide Standards & Guidelines located in Chapter 4:

Resource	Section	Sub-Sections	Page
Air	AIR	All	4-3
Beach And Estuary Fringe	BEACH1 BEACH2	All I,II(A-I,K,L)	4-4
Facilities	FAC	All	4-6
Fire	FIRE	All	4-7
Fish	FISH	All	4-8
Forest health	HEALTH	All	4-13
Heritage Resources	HER	All	4-14
Karst And Cave Resources	KARST,CAVE	All	4-18
Lands	LAND	All	4-21
Minerals And Geology	MG	All	4-32
Recreation And Tourism	REC	All	4-34
Riparian	RIP1 RIP2	All I,II(A-E)	4-52
Rural Community Assistance	RUR	All	4-73
Scenery	VIS	All	4-74
Soil And Water	S&W111,1112,2 S&W112	All I(A:1-4,6-7)II,III	4-82
Subsistence	SUB	All	4-85
Threatened, Endangered, Sensitive	TE&S	All	4-87
Timber	TIM111-1,130,140 TIM114	All VIII	4-93
Trails	TRAI	All	4-100
Transportation	TRAN111,122,212,22,23 TRAN214	All I-IV	4-102
Wetlands	WET	All	4-109
Wildlife	WILD112,WILD23	All	4-110



# Management Prescriptions

## Apply the following Land Use Designation Standards & Guidelines:

### FACILITIES

#### Facilities Improvements: FAC2

- A. Allow administrative, interpretive, and information sites as needed to accomplish Special Interest Area objectives.

### FIRE

#### Fire Suppression: FIRE12

##### *Suppression Action*

- A. Suppress wildfires using the suppression action that minimizes fire suppression cost and resource damage. The action must meet the Special Interest Area objectives.
- B. Suppression tactics will be compatible with Special Interest Area objectives.

#### Fuel Improvements: FIRE2

##### *Prescribed fire*

- A. Use management-ignited prescribed fire if it is compatible with the Special Interest Area objectives.
- B. As a general management practice, do not use prescribed natural fire. Should it become necessary to consider the use of prescribed natural fire, the Forest Plan must be amended to analyze, justify, and approve prescribed natural fire programs. (Consult FSM 5142.)

### FISH

#### Fish Habitat Planning: FISH112

- A. Provide for public interpretation of fish habitats, habitat enhancement projects, and associated special fisheries conditions in appropriate Special Interest Areas.
- B. Allow fish enhancement projects if they are compatible with Special Interest Area objectives.

### FOREST HEALTH

#### Forest Health Management: HEALTH1

- A. Implement insect and disease management measures, consistent with Land Use Designation objectives, to protect the area's special features and adjacent resources.

#### Forest Insect and Disease Survey and Inventory: HEALTH2

- A. Survey and inventory visible outbreaks.

### HERITAGE

#### Heritage Resource Activities: HER

##### *Inventory*

- A. Identify significant heritage properties that include archaeological, historical, religious, or areas that contain specific forest resources of heritage value used for Native art and craft forms.

##### *Evaluation and Protection*

- A. Heritage Resource properties which are classified as Special Interest Areas under 36 CFR 294 shall be evaluated for the National Register of Historic Places and as possible National Historic Landmarks as established in 36 CFR 63.
  - 1. Establish the exterior boundary of heritage resource properties on the ground if determined necessary to protect the site.



2. Protect heritage resource properties from degradation from effects of management activities occurring within adjacent Land Use Designations.
3. Manage for the availability and use of forest products for traditional native heritage activities, while maintaining the physical and scientific integrity of the heritage resource properties.
4. Provide interpretive devices to explain special features and protective regulations.
5. Provide for interpretive activities that enhance the recreation experience, while protecting the unique values for which the heritage resource property was designated.
6. Prevent the use of heritage resource property when national policy or sensitivity of unique values requires closure.

### **KARST AND CAVES    Cave Management Program: CAVE**

- A. Identify opportunities for interpretation of caves for public education and enjoyment. Interpretation may occur inside or outside of this Land Use Designation.

### **LANDS**

#### **Special Use Administration (Non-Recreation): LAND122**

- A. Issue only those Special Use Authorizations which will perpetuate the unique values that led to the designation or proposal to designate the Special Interest Area.
  1. Issue authorizations which will aid in the maintenance, improvement, and protection of the existing characteristics and attributes of the Special Interest Area.
  2. Analyze each proposal on a case-by-case basis, using an interdisciplinary process.
- B. This Land Use Designation represents a Transportation and Utility System (TUS) "Avoidance Area." Transportation and utility sites and corridors may be located within a Special Interest Area only after an analysis of potential TUS opportunities has been completed and no feasible alternatives exist outside the Land Use Designation.

#### **Land Ownership Adjustments: LAND26**

- A. Acquire private inholdings as opportunities arise.

### **MINERALS AND GEOLOGY**

#### **Minerals and Geology Resource Preparation: MG11**

##### *Resource Preparation*

- A. Prepare geologic, paleontologic, and historic mining interpretations of Special Interest Areas where appropriate.

#### **Minerals and Geology Administration: MG2**

##### *Forest Lands Withdrawn from Mineral Entry*

- A. Consider recommending that Special Interest Areas be withdrawn from mineral entry, subject to valid existing rights, when mining would not be compatible with the Area's objectives.
- B. Permit reasonable access to mining claims with valid existing rights in accordance with the provisions of an approved Plan of Operations.

# Management Prescriptions

## *Plan of operations*

- A. Reduce impacts to the extent feasible when developing minerals. Include mitigation measures that are compatible with the scale of proposed development and commensurate with potential resource impacts.
- B. Apply appropriate Transportation Forest-wide Standards & Guidelines to the location and construction of mining roads and facilities.

## **RECREATION AND TOURISM**

### **Recreation Use Administration: REC122**

#### *Recreation Management and Operations*

- A. Regulate use based on studies reflecting the effect of recreation and tourism activities on the unique features for which the Special Interest Area is established. Studies need only be done where a conflict may exist.
  - 1. Consider providing interpretation of the unique characteristics of the Special Interest Area.
  - 2. If studies indicate human use adversely affects the special features, regulate use to eliminate the adverse effects or reduce use to acceptable levels.
  - 3. Design and locate recreation-related structures to be compatible with characteristics of the area. Regulate user-created structures to avoid degradation of the unique character of the area. (Consult FS Recreation Site Development Handbook.)
  - 4. Restrict public motorized travel to designated travel routes except for powerboats operating on open water channels. (Consult FS Off-Road Vehicle Management Handbook.)
- B. Adopt ROS classes through project planning and manage according to the adopted ROS class. Before project planning, manage according to the existing ROS class.

#### *Recreation Special Uses*

- A. Major and minor developments may be compatible with the Land Use Designation objectives depending on the scope, purpose, and magnitude of the proposal. Proposals will be evaluated on a case-by-case basis. Refer to the Recreation and Tourism Forest-wide Standards & Guidelines.

## **SCENERY**

### **Scenery Operations: VIS1**

- A. Manage Areas for their visual integrity, with most areas in a naturally-appearing condition.
  - 1. Apply Forest-wide Standards & Guidelines for the Retention Visual Quality Objective, except in the portions with developed recreation or interpretive facilities (such as Mendenhall Glacier, Ward Lake, and Blind Slough).
  - 2. In those portions with developed recreation or interpretive facilities (such as Mendenhall Glacier, Ward Lake, and Blind Slough), apply the Visual Quality Objective of Modification in the foreground and Partial Retention in the middleground and background.
  - 3. Design visitor facilities to blend, to the extent feasible, with the natural setting.

## **TIMBER**

### **Timber Resource Planning: TIM112**

- A. Forested land is classified as unsuitable for timber production. Timber removal associated with development or maintenance of interpretation activities in Special Interest Areas is nonchargeable to the Allowable Sale

## Management Prescriptions

Quantity. Forest products are available for continued traditional Native artistic use, if not in conflict with Special Interest Area purposes,

- B. Manage personal use wood harvest and Christmas tree cutting activities to be consistent with Land Use Designation objectives.

### **TRANSPORTATION    Transportation Operations: TRAN1**

- A. Provide and manage a transportation system compatible with, or which will improve the interpretation of, the unique values of the Special Interest Area. (See exceptions under the Lands and Minerals & Geology sections of this prescription.)

### **WILDLIFE                Wildlife Habitat Planning: WILD112**

- A. Provide for public interpretation of wildlife habitats and associated special wildlife conditions in appropriate Special Interest Areas.
- B. Allow wildlife improvement projects where they are compatible with the purposes for which the Special Interest Area was established.





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